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for Numerous read Numbers
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for 13 read 18
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for S. Richard & Galeotti in Ann. Sci. Nat., ser. 3, 3 (1845) 24, read "A. Rich. & Gal." ex Reichenbach filius in Bot. Zeit. 10 (1852) 766
page 94, line 1
for Arzneigewachse read Arzneigewächse
page 103, line 3
for specimen read spécimen
page 103, line 21
for Arzneigewachse read Arzneigewächse
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page 123, line 31
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page 135, line 25
for *Hexapetion* read *Hexopetion*
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for data is read data are

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THE FOSSIL FLORA OF IOWA COAL BALLS
III. CORDAIANTHUS

BY
WILLIAM C. DARRAH

THE two most ancient, primitive and extinct orders of gymnosperms are known as the pteridosperms or seed ferns and the cordaites. The pteridosperms are not strobiloid because the sporangial organs are borne pinnately, not spirally or whorled. The cordaites, on the contrary, have short axes (branches) bearing a number of small, spirally disposed "strobili" or "inflorescences." In fact, the interpretation of these structures has been a controversial problem for nearly seventy years.

There have been two chief limitations imposed upon the investigation of the fructifications of the *Cordaitales*, one being the excessive rarity of structurally preserved specimens, though so-called impressions have been fairly abundant; the other limitation being the narrow point of view of the plant morphologist, who by necessity has interpreted the fossil remains. Since the cordaites possessed a construction similar to that of the coniferophyte body, it was natural that comparisons would be made with the strobili of existing coniferous and gnetalean types. Paleobotanists are endeavoring constantly to go back to antiquity and describe the earliest forms and to suspend judgment upon homologies until the extinct forms are adequately understood.

Until very recently (1938), the only structurally preserved strobili attributed to the Cordaitales were derived from the late Carboniferous (Stephanian) rocks from the region of Grand Croix, especially near Comb' Rigolle in central France. Only three or four well preserved specimens had been found elsewhere. Doctor Rudolf Florin of the Natural History Museum at Stockholm is at present preparing an exhaustive monograph of the Grand Croix material. The discovery of geologically older cordaitean strobili in American coal balls from Iowa and Kansas affords an opportunity to add considerable information toward an understanding of these ancient plants.

The Cordaitales are a natural order of extinct gymnosperms not intimately related to any existing plants, but are believed to be next-of-kin to the Ginkgoales, and somewhat more distantly to the living conifers. As far as we know, they were the first forest trees, attaining in many species a height of thirty meters or more. In general appearance, they must have closely resembled the existing conifer *Agathis*, having broad linear leaves rather than needle-like foliage.

The detached strobili of the Cordaitales are designated by the artificial form-genus name *Cordaianthus*. The strobili are monosporangiate; consequently there has been some confusion over generic and specific designations. In the older papers, the name *Antholithus* is sometimes applied to male *Cordaianthus*, though the name is also used to designate male inflorescences of other plants.

In order to introduce the terminology relevant to *Cordaianthus* and the interpretation of the strobilar construction, a new species from the late Carboniferous of the United States is here described.

Cordaianthus shuleri *Darrah sp. nov.* with five plates, twenty figures.

Inflorescence a long rigid shoot bearing monosporangiate strobili in the axils of rigid bracts. Strobili borne spirally. Strobili composed of a short stout axis bearing numerous spirally disposed bracts some of which are fertile.

Female strobilus having from one to four erect terminal ovules borne singly upon woody bracts which are tetragonal in transverse section. All of the ovules still attached in the strobili are immature, somewhat "flattened," and bilaterally symmetrical. There appears to be only one integument.

Male strobilus bearing from one to numerous (six or more) woody microsporophylls which are tetragonal in transverse section like the sterile bracts. Each microsporophyll bears six terminal erect microsporangia or pollen-sacs which are 2.2 to 2.4 mm. in length, outlined by dense "palisade" cells and containing a tissue of isodiametric thin-walled parenchyma. Pollen-grains large, ellipsoid, winged. Male gametophyte composed of many (more than twenty) cells.

Iowa: Dallas County, Waukee, Shuler Mine. 42580 (Holotype); 42468, 42471, 42472, 42473, 42474, 42581, 42582, 42585, 42586, 42603 Supplementary types (Plesiotypes). F.O.Thompson Coll.: Polk County, Walnut Township, Urbandale Mine. F.O.Thompson Coll.: Lucas County, Williamson Mines 3, 4 and 5. F.O.Thompson Coll.: Wapello County, s.w. of Ottumwa, Tillotson Mine. F.O.Thompson Coll.

Kansas: Crawford County, Frontenac. F.O.Thompson Coll.

Carboniferous: Pennsylvanian: Des Moines Series.

The type and plesiotypes are from coal known locally as number 7.

Discussion.

The diagnosis given above is based upon one hundred well preserved specimens of individual strobili and five specimens showing more than five strobili on a single axis.

These preparations were selected from slides of more than 800 different specimens represented by nearly 2200 slides. Serial sections of four strobili (three male, one female) have been made.

The largest individual strobilus which I have observed has a length of 13 mm. and a maximum width of 7.5 mm. The proportion of length to width is approximately two to one. The average size of twelve good female strobili is 10.5 mm. $\times$ 5.2 mm. The width varies considerably (3.5 to 5.7 mm.), but some distortion may have been responsible for the extremes.

The best preserved male strobilus is 11 mm. long and 4.8 mm. wide, although two good specimens are broader (10 mm. long and 6 mm. wide).

In both male and female strobili the enveloping woody bracts vary from 3.5 mm. to nearly 6 mm. in length, the average being 4.5 mm. The bracts are broad at the base, curve upwards and inwards (at least when young), and gradually taper to a narrow, sometimes pointed tip. Bracts provided with a single leaf-trace composed of a number of spiral tracheids, surrounded by crushed phloem which is miserably preserved. The trace has been termed "protostelic," but "mesarch" is more suitable.

It appears, then, that the strobilus is a very simple organ system borne in the axil of a bract. This is best shown on figure 3 which reveals a single ovulate strobilus on a short thick pedicel, the whole strobilar aggregation being axillary. Figure 1, a more mature inflorescence shows (at least in the middle strobilus to the left of the axis) a short bract.

The whole fructification, it would seem to me, is a naked branch system bearing a number of small strobili. I have before me an impression of an inflorescence attributed to *Cordaianthus gemmifer* Grand' Eury, a poorly

defined species of late Carboniferous age. The specimen in hand (number 26613, Mazon Creek, Grundy County, Illinois) shows an incomplete inflorescence 130 mm. long, bearing, near the apex, apparently spirally disposed strobili, of which forty-two are visible. At the base these appear to be nearly opposite and distichous. We have sawed the specimen transversely to the long axis, and observed at this plane only two subopposite strobili. It would seem that in this specimen the arrangement is really distichous, as conventionally described, but this is not always the case. Figure 5 shows a pair of ovulate buds lying adjacent to the axis which bears them. Leaves envelop the whole structure, but it is not possible to determine whether they were borne upon the same axis as the strobili. Figure 6 shows four ovulate strobili attached to the axis of the inflorescence. A single ovule is borne in each strobilus. Figure 7 illustrates a series of four staminate strobili, one of which is attached to the axis, a second, nearly opposite to the first, is detached in this plane but is connected below, and the other two are from a still lower series. Renault (1879, pl. 17, fig. 1) figured a specimen from Grand Croix which had five strobili attached spirally on an axis. It is certain that *Cordaianthus shuleri* has a similar arrangement of the strobili. Grand' Eury (1877, pl. 26, fig. 11) illustrated a specimen of *Cordaianthus baccifer* which shows a densely packed series of strobili arranged spirally upon a common axis.

Not much histological detail can be gleaned from our slides of the axis. The transverse sections show a nearly round, distyostelic stele, except at the nodes where the strobili and bracts arise. Here the sections are greatly elongated, and the stele presents a flattened appearance. The pith is not very extensive (0.8 mm. $\times$ 4.5 mm.) and the xylem forms a broad zone of wood. Cortical tissues are not well preserved. One can determine the nature of

the tracheids in longitudinal section: the innermost seem to be spiral, while those of the next zone (proceeding outwards) are scalariform, and those of the narrow outermost zone are pitted. It is of some interest to note that this gradation has been observed in the stems of both *Cordaites* and *Mesoxylon*.

The individual strobilus, regardless of sex, is correspondingly simple. A stalk or pedicel (figure 2) bears a large number of spirally arranged segments (figure 4) which are tetragonal, but somewhat rounded in transverse section. The stele is solid but medullates (figure 2) quickly. A single trace runs out into each segment, both fertile and sterile.

The outermost bracts are very woody (figure 10) and these envelop a large number (fifty to ninety, or more) of segments (figures 9, 12). The innermost members are slender and acicular.

Occasionally the female strobilus may bear several ovules, for example, three (figure 13). We have made serial sections of the specimen here illustrated, but the degree of preservation does not permit a full analysis of the phyllotaxic arrangement of the segments. In those strobili which bear only one ovule, the ovule is absolutely terminal and all sterile segments are placed spirally beneath it.

The male strobilus is clearer and more understandable. Each fertile segment normally bears six erect pollen-sacs which are filled usually with the partially developed pollen-grains. Figure 17 illustrates several clusters of pollen-sacs and figure 18 shows, at a greater magnification, masses of pollen from two stamens. The individual winged pollen-grains are shown in figures 19 and 20. The specimen illustrated in figure 16 shows a single strobilus with pollen in the center. In this specimen the walls of the sporangia have disappeared except at the periphery

of the mass. The mechanism for dehiscence has not been observed. It is noteworthy that the male gametophyte in the pollen-grain is multicellular, often with more than twenty cells. However, the great majority of pollen in the sacs have only five to seven cells visible.

I should like to call attention to an anomalous feature of the young shoot illustrated in figure 3. Serial sections (fourteen) through this specimen revealed only one developed strobilus on three sides of the inflorescence; the fourth side was destroyed when the coal ball was first sawn in two. However, there are the unmistakable structures of a verticillate arrangement. The vascular strands occur in series of four at approximately 90 degree angles. Attention is called also to figure 6, which might well be from the same individual, although it was cut from another portion of the coal ball. Since these two specimens are quite immature, I see no reason for placing them in a distinct species. It is possible that they do actually belong to another species, but only additional material could offer conclusive evidence.

Relationships.

When one attempts to compare *Cordaianthus shuleri* with other cordaitean fructifications one encounters certain fundamental difficulties. The relatively abundant preserved material from central France which shows structure belongs presumably to the stems known as *Poroxylon*. Most of the older cordaitean stems (as found in England, Germany and Holland) are distinguished by significant differences in the nature of the protoxylem and leaf traces, and are referred to the form-genus *Mesoxylon*. Strobili attributable to stems of the *Mesoxylon* type are very imperfectly known. This uncertainty is unfortunate because all of the cordaitean stems from Iowa coal balls, thus far studied, belong to *Mesoxylon*.

Cordaianthus shuleri is the only species based upon fructifications of *Cordaites* (or *Mesoxylon*) for which both staminate and ovulate strobili are known. Indeed, there are paleobotanists who would insist on giving distinct specific names to the two sexes; and this in spite of the similarity in size, construction, and histology of the two types of strobili.

Cordaianthus shuleri belongs to a species of *Mesoxylon* (4, p. 129).

In 1918, D. H. Scott reported the occurrence of special axillary shoots associated with *Mesoxylon multirame* which has a more or less flattened stele, a bilaterally symmetrical construction and a distichous arrangement of branches bearing spirally arranged bracts. In the following year, he described (18) these fertile shoots in detail and referred to them the seeds known as *Mitrospermum compressum* A. Arber (1) which, however, (despite a remarkable frequence) were not found in organic attachment. Scott was of the opinion that the dozen seeds lying near a single shoot were probably originally attached to it.

A nearly transverse section of the axis of *Mesoxylon multirame* measured 6.5 mm. $\times$ 1.5 mm. and showed a detached branch lying proximal to the main axis. In this branch the stele was round and had a large pith. Scott described each branch as receiving a small stele from the main shoot, but this stele rapidly expanded and became medullated. The bracts had a single mesarch vascular bundle. The wood of the fertile shoot consisted of spiral and scalariform tracheids, and conforms with the inner zone of wood of the ordinary *Mesoxylon* stem. This structure is in reality a *Cordaianthus*.

Scott described this inflorescence, belonging without reasonable doubt to *Mesoxylon multirame*, from the middle Carboniferous of Britain. The specimen he figured consisted of naked shoots borne in the axils of leaves. A

number of isolated specimens have also been found which show the chief morphological features of the whole inflorescence. There is a leafless main axis which bears distichous bud-like branches, and each bud-branch bears spirally disposed bracts which have a single mesarch leaf-trace. The branch possessed a ring of vascular strands. The sex of the inflorescence was not apparent because neither stamens nor ovules were preserved. On the basis of the sturdiness of the bracts, Scott suggested that it was female. Renault believed (on limited material) that the bracts of the female strobilus were thicker, more robust, and more coriaceous than those of the male. Recently Hirmer (11) has placed this fossil form in *Gothania*, a name which in my opinion is unnecessary, because it is a form-genus within a form-genus. As we have little acquaintance with the axes of the Grand Croix *Cordaianthus*, it seems undesirable to segregate certain forms of *Cordaianthus* which have an axis with a large pith or a ring of xylem bundles.

Turning now to the *Cordaianthus* from the Stephanian of central France, we find a great volume of published observations and opinions. In fact our concepts of the fructification of the Cordaitales are based exclusively on them.

The female fructification has usually been described as having stout, woody bracts (spirally disposed on the axis) with a single ovule borne on a short stalk in the axil of some of these bracts. Some years ago, Schoute (17) made a study of the phyllotaxy of *Cordaianthus zeilleri* and concluded that each organ which bears an ovule replaces a leaf; thus the ovules and their pedicels have the morphological value of very simple sporophylls. The female fructification is a strobilus, not an inflorescence.

Cordaianthus williamsoni Renault has a thick conical axis bearing spirally disposed woody bracts, in the axils

of some of which, according to Renault, were borne very short stalks with several bracteoles and terminal ovules. This species is known only by longitudinal sections. C. E. Bertrand (3) reinvestigated the female strobili of *Cordaianthus* and concluded that Renault's interpretation of these structures must be discredited. More recently, as indicated above, Schoute and Florin have proposed a simple interpretation of the ovulate strobilus.

C. E. Bertrand described the ovulate strobilus as consisting of an axis clothed completely by the bases of the bracts. The axis contains a vascular cylinder of ten strands which are separate. Each bract is supplied with a single vascular bundle which is essentially similar to a single strand of a typical vegetative leaf. The bract contains hypodermal bands of fibrous tissue.

The regrettable misinterpretation of the female strobilus has resulted in false reasoning. The ovulate strobilus accordingly has been termed compound because supposedly a fertile "branch" arises in the axil of a bract. Since a similar strobilar construction was believed to exist in the conifers, the so-called ovuliferous scale has been compared to an axillary shoot.

Scott (19) aptly said "that the data are insufficient for the interpretation of the female catkin in terms of any recent gymnospermous fructifications." It has been shown recently that if any comparison can be made, it must be with the very similar strobili of *Walchia* and its kin (*Voltziales*).

Florin (8) has also recognized the simple nature of the strobilus of *Cordaianthus* and thus affirms the opinion of Schoute. The species upon which his interpretation is based was described originally by Kidston as *Cordaianthus profluitans*, but material newly collected afforded considerable additional information. In this form, the stalks of the ovules are flattened and are similar to the

sterile bracts. He described the bundle of each bract as "protostele-like," having protoxylem in the center of the xylem mass. The seed is described as being terminal, erect and provided with a single integument.

Florin has shown conclusively in this paper that the ovulate strobilus of *Cordaianthus* and that of the extinct Carboniferous and Permian conifers of the *Walchia* type are fundamentally alike. In deference to Doctor Florin, who only preliminarily published and provisionally described these groups, I make no attempt to draw generalizations from the Iowa specimens, beyond the concept of the species.

The male fructifications have usually been described, following Renault, as a thick axis bearing spirally arranged bracts with the sex organs inserted between them. A number of nominal species have been named from structurally preserved specimens. The best known "species" is *Cordaianthus penjoni* Renault. In this form the stamens are spirally arranged and are inserted between robust, woody, acicular bracts. It is probable that the stamen is a fertile bract. Each "stamen" consists of a sporophyll (not a filament) upon which are borne six (one to six) elongate pollen-sacs (7). Pollen of this species and of another, *Cordaianthus saportanus* Renault, have been observed. They are ellipsoidal, approximately 0.09 mm. $\times$0.05 mm., and have extensive gametophytic tissue within the intine. The number of cells often exceeds thirty. Renault originally described them as having ten to twenty equivalent cells.

The strobilus, at any rate, is a simple structure sometimes interpreted as a "mixture of sterile and fertile microsporophylls." Renault described the staminate strobilus as being extremely simple, formed of only a few stamens. He believed that the entire structure was a flower. Solms-Laubach (21), later, interpreted the "sta-

men" as a flower, and the so-called filament as the "flower stalk." Thus he made comparisons with the Gnetales. All of these opinions have been rendered untenable. All of the existing gymnosperms have had long ancestries, at least into the early Mesozoic. Each group in its own manner has been modified or elaborated from simple types. It is to these simple types such as *Cordaianthus* that we must make recourse, instead of working backwards from extant forms of uncertain ancestry.

Other Cordaitean remains associated with the strobili.

It is not my intention to give a detailed description of seeds, leaves, or woods, which form conspicuous components of the large Iowa coal ball flora. Three previously described types, however, are abundant and, as they possibly belong to *Mesoxylon*, brief records of them are incorporated herewith.

Cordaites (Cordaitophyllum) cf. **crassus** *Grand' Eury.* (Figure 21).

There are a large number of cordaitean leaves in the Iowa coal balls, and these reveal considerable variability, so much so, that one is forced to accept the probability of the presence of at least several species. The example illustrated here is the most abundant. Three morphological characters are noteworthy: (1) the fairly extensive development of sclerenchymatous tissue near both the upper and lower surfaces of the leaf with much larger pointed masses projecting upwards usually, though not absolutely consistently, between every two vascular bundles; (2) the homogeneity of the parenchyma without the development of a palisade tissue near the upper surface; and (3) the small mesarch vascular bundles which are surrounded by a sheath of tissue of somewhat doubtful

origin. The only described leaf which seems to be characterized by similar features is *Cordaites crassus* Grand' Eury from Grand Croix in central France.

There is some uncertainty, however, concerning the validity of the numerous species based on leaves which have been provisionally recognized. Numerous of the Iowa coal balls contain leaves that appear to be much nearer to *Cordaites felicis* Benson (2) which is most probably the foliage of *Mesoxylon multirame*. To Benson's species belong at least three and perhaps four nominal species.

Felix in 1886 (6) described three types of leaves from the Westphalian rocks of the Ruhrgebiet under the names *Cordaites wedekindi*, *C. loculosus*, and *C. robustus*. He had only a limited number of thin sections at his disposal and was obliged to name three distinct forms. In 1912 in an important communication, the late Dr. Margaret Benson described *Cordaites felicis*. She was able to determine much of the histology of the whole leaf. The basal portion of *C. felicis* possessed a construction similar to that of *C. loculosus* and *C. robustus*. The upper portion resembled considerably *C. wedekindi*. Benson was not able to demonstrate the specific identity of all of these forms, but Koopmans (13) has not hesitated, on the basis of Dutch material and comparative studies, to unite them into *C. felicis*. There is a point of nomenclatorial priority here which must be determined in keeping with standard procedure. Koopmans also believes that *C. weristeri* Leclercq (14) belongs to *C. felicis*.

Inasmuch as several sections from a single leaf have a strikingly variable structure, related of course to the portion from which the section was made, it seems unwise to propose a specific name for the figured specimen without qualification.

Cordaicarpus spinatus *Graham* in Bot. Gaz. vol. 97, p. 165, figs. 23, 24, 1925.

This well characterized seed was described from "longitudinal sections . . . of two seeds, and transverse sections of the half of one," from coal balls collected in the Calhoun Mine, Richland County, Illinois. McLeansboro Formation (Pennsylvanian Upper [?] Conemaugh Series). Our specimens conform in nearly all details to Graham's description.

The platyspermic seed has a very thick sclerotesta with spiny outgrowths. The type specimens have the following dimensions: 6.5 mm. long, 8 mm. wide, 3.5 mm. thick. Graham (9) reported that the fleshy sarcotesta had been almost completely destroyed in his specimens.

The example illustrated by figure 22 shows a well preserved sarcotesta and the seed measures 11 mm. in length and 5 mm. in thickness. Serial sections (eighty-three) were made from this specimen, but the exact width cannot be computed because a considerable amount of material is lost by grinding the surface of the specimen before a new peel is prepared. Another well preserved seed having almost the identical length (10.8 mm.) has a maximum width of 10 mm.

Graham's figures are not to be considered erroneous, rather they are based upon incomplete specimens. I do not propose to emend the specific diagnosis of this seed for the present, inasmuch as I am studying a young embryo of the same species.

Cordaicarpus spinatus is the most abundant seed in the coal balls from the vicinity of Waukee, Iowa (Shuler Mine and Urbandale Mine). I have seen specimens of this species also in coal balls from Frontenac and Pittsburg, Kansas. All of them were collected by or for F.O. Thompson.

Cordaicarpus species (Figure 24).

It is unnecessary to give a new name to this seed for the present, although it seems to represent an undescribed species. Dr. Fredda Reed (15) recently described, without specific name, a small cardiocarp (Bot. Gaz. vol. 100, p. 784, fig. 26, 1939) which may well be identical with the seed here reported. It shows a more or less spinous sclerotesta.

The remarkable agreement in all dimensions of the impressions with the dimensions of the complete seeds known in detail under the name *Cordaicarpus spinatus* suggests that, when histological study of the seed has been completed, it may reveal a close similarity to a *Cordaicarpus* of the *spinatus* type.

In my opinion either of these cordaicarps represents the seed of *Cordaianthus shuleri* and the implication is that perhaps both seeds are only different aspects of one and the same form.

SUMMARY.

Cordaianthus shuleri Darrah is a new species of cordaitean fructification, referable to the stem-type known as *Mesoxylon*. Both male and female strobili are known from many specimens. Their construction is similar, and the strobili are very simple aggregations of spirally disposed segments some of which are fertile. Those female strobili which bear a single ovule have the ovule terminal. Those which bear several ovules bear them near the summit of the conical tip of the axis. The male stobilus bears a number of sporophylls each of which is surmounted by six erect, elongate pollen-sacs. The pollen bear extensive gametophytic tissue.

Attention is called to the abundant and varied detached leaves of *Cordaites* found in nearly all of the coal balls, and one type is provisionally referred to *Cordaites crassus* Grand'Eury.

Two seed types have been illustrated. One, *Cordaicarpus spinatus* Graham, has hitherto been known from incomplete specimens. A second type, unnamed, is believed to represent the external view of *Cordaicarpus spinatus*.

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EXPLANATION OF THE ILLUSTRATIONS

CORDAIANTHUS SHULERI *Darrah*

FIGURE 1. Cellulose nitrate peel of the holotype specimen showing seven strobili (male), six of them attached to the naked axis. The seventh strobilus is represented by a few bracts in the space on the right beneath the apical strobilus. ×3. Peel 8. Specimen 42580.

FIGURE 2. A single strobilus. It is the strobilus to the left of the small circle near the top of the inflorescence shown in figure 1. The medullation of the axis and the departure of a number of traces are evident. Pollen-sacs not visible. ×10. Peel 5.

FIGURE 3. A young inflorescence, showing a single ovulate strobilus, bearing an erect terminal ovule. The spirally disposed sterile segments are inserted upon a somewhat elongate branch or axis. The subtending bract is conspicuous. ×5. Specimen 42648.

FIGURE 4. A sagittal section through an ovulate strobilus. The blackened area near the top consists in part of sterile bracts and in part of integumentary tissues of an ovule. The closely inserted bracts are shown in various views. ×10. Specimen 42471.

FIGURE 5. Two immature ovulate strobili ("buds") adjacent to the circular axis which bears them, and lying between two leaves, seen in vertical sections. ×5. Specimen 42472.

FIGURE 6. A transverse section through an inflorescence, taken at right angles to the axis, showing four ovulate strobili, all attached. The strobilus at the bottom left shows an ovule with a prominent "micropylar beak." ×5. Specimen 42474.

FIGURE 7. A nearly transverse section through a staminate inflorescence. ×5. Specimen 42581.

FIGURE 8. A longitudinal section through the basal portion of the inflorescence shown in figure 7. ×5.

FIGURE 9. A transverse section through an immature staminate strobilus, showing the enveloping bracts around the periphery, and the more acicular bracts near the center. ×10. Specimen 42473.

FIGURE 10. External view of a strobilus (sex undetermined) showing the woody bracts. Exposed from matrix. ×10. Specimen 43316.

FIGURE 11. Immature staminate strobilus, peel taken along a longitudinal median plane. Axis cut slightly diagonally. ×10. Specimen 42473.

FIGURE 12. Transverse section through the basal portion of an ovulate strobilus, just below the region of coalescence of the ring of woody bundles in the medullated portion of the strobilar axis. ×10. Peel 52. Specimen 42603.

FIGURE 13. Transverse section through the same specimen showing three ovules, one (upper right) broken in this peel. Poorly preserved sclerotesta and sarcotesta not yet differentiated. ×10. Specimen 42603.

FIGURE 14. Sagittal section through a staminate inflorescence showing seven strobili, the middle one showing the "siphonostelic" axis of the strobilus. ×5. Specimen 42586.

FIGURE 15. Sagittal section through another staminate inflorescence with three strobili. The one to the right showing the axis of the strobilus and the one to the far left with masses of pollen. ×5. Specimen 42582.

FIGURE 16. Transverse section through a staminate strobilus bearing a dense mass of pollen in the center. The pollen represents three "stamens" (eighteen pollen-sacs). ×10. Specimen 42581.

FIGURE 17. Diagonal section through a staminate strobilus showing pollen-sacs crowded with pollen. ×10. Specimen 42585.

FIGURE 18. Pollen-sacs of the specimen shown in figure 17. ×64.

FIGURE 19. A single winged pollen-grain, not fully developed, dorsal view. ×250. Specimen 42585.

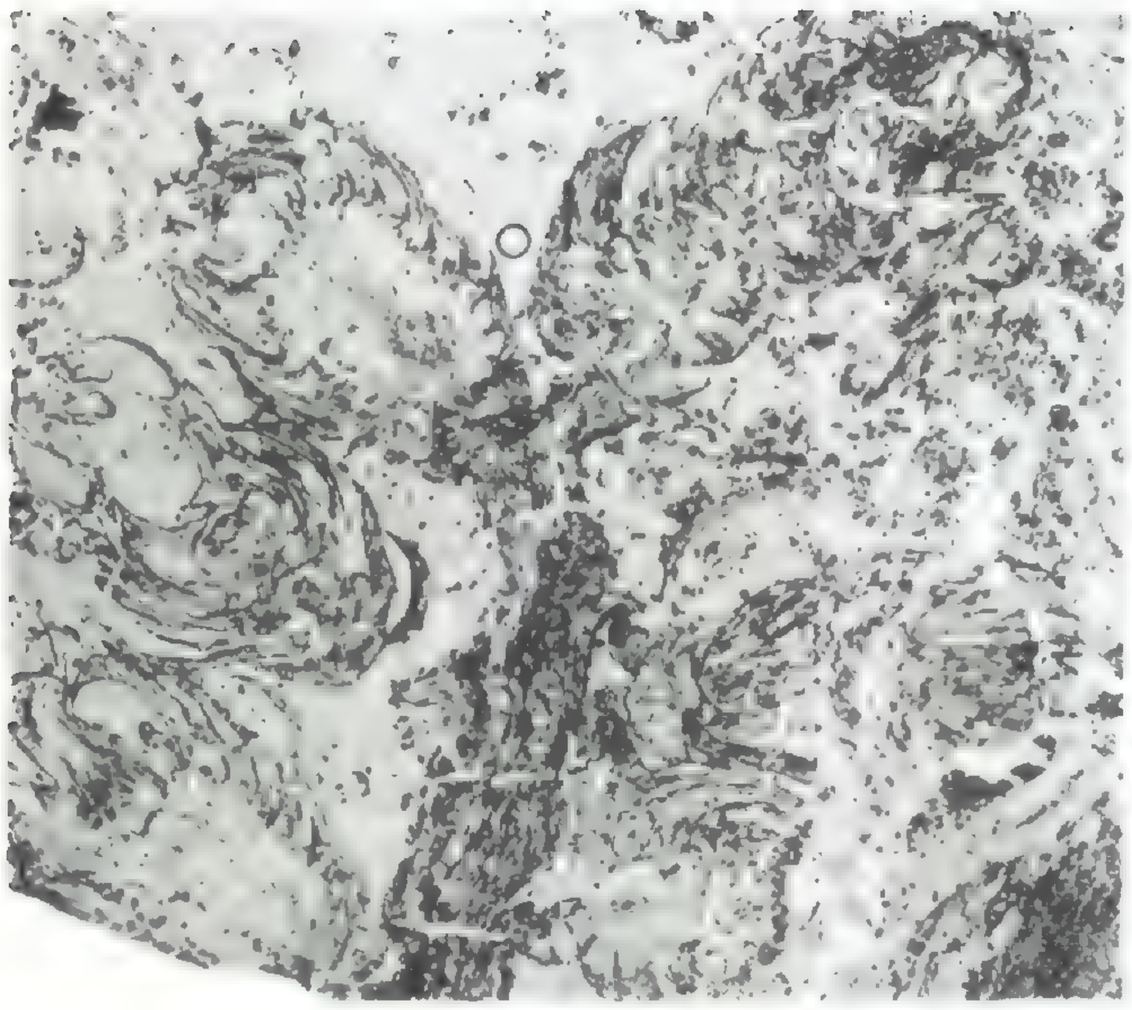
FIGURE 20. Two pollen-grains, dorsal view. Multicellular gametophyte indicated by presence of cell walls in the central body. ×250. Specimen 42585.

FIGURE 21. *Cordaites* cf. *crassus* Grand' Eury.
Portion of a leaf in vertical section, showing the parallel mesarch vascular strands and the sclerenchymatous tissues near the upper and lower surfaces. ×10. Specimen 43686.

FIGURE 22. *Cordaicarpus spinatus* Graham.
Side view (slightly diagonally) through a seed, showing the spinous sclerotesta and the fleshy sarcotesta. Cut sagittally beyond the micropyle. ×5. Specimen 39805.

FIGURE 23. *Cordaicarpus sp.*
A "front" view of a broken seed showing the endosperm body in the center, and the sclerotesta and sarcotesta on the outside. The round body near the upper left is an unnamed seed. ×5. Specimen 39805.

All figures, except 10 and 23, are from photographs of cellulose nitrate peels. These heliotype reproductions may be examined with a hand lens.



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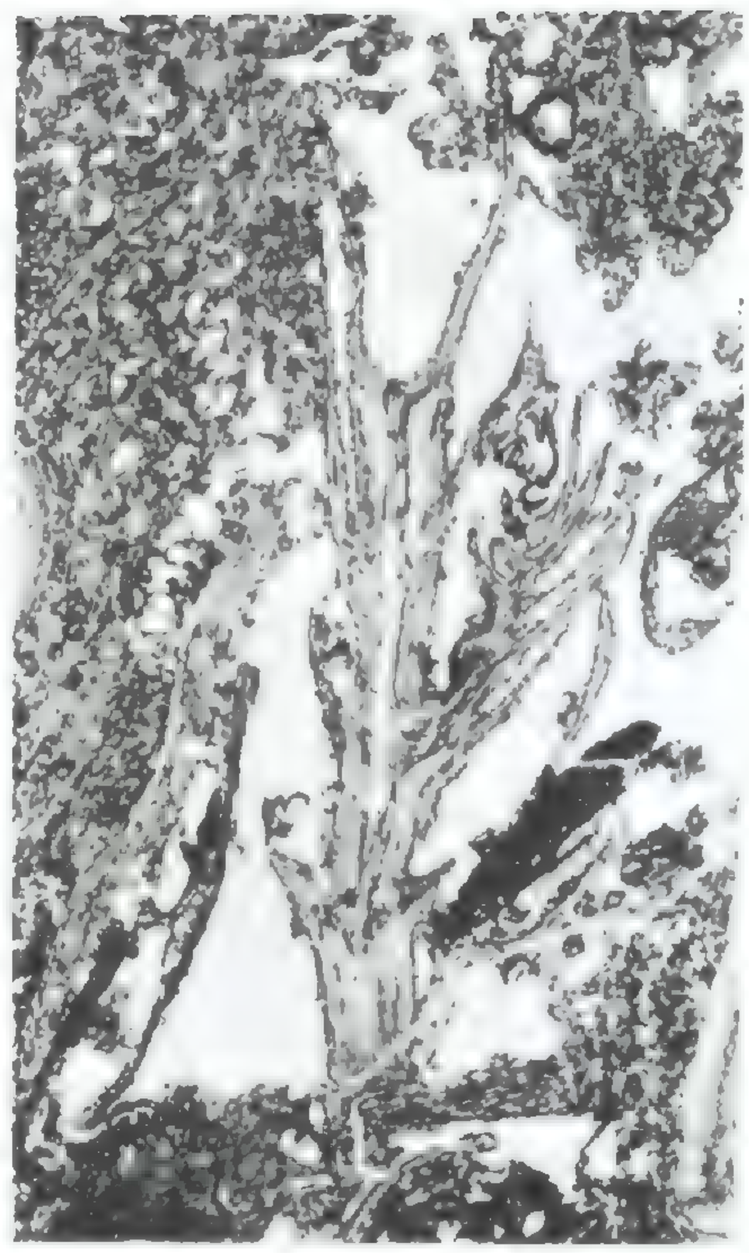

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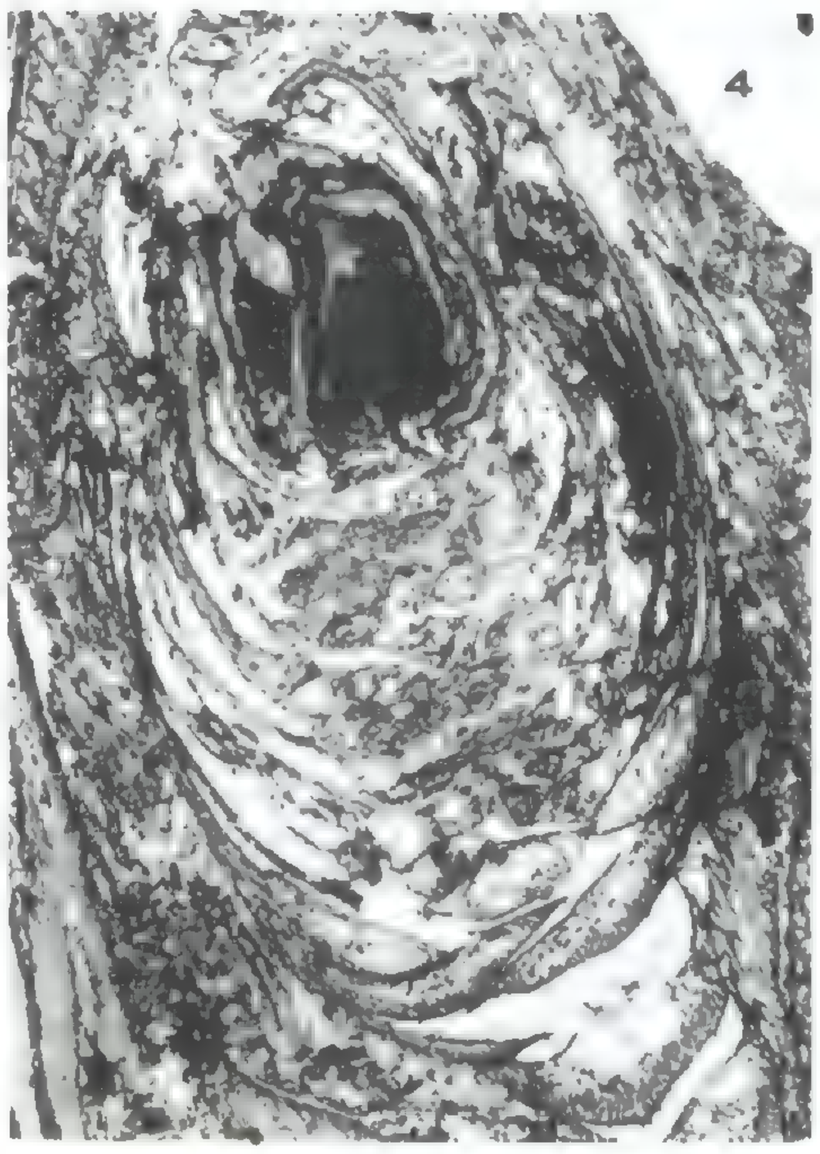

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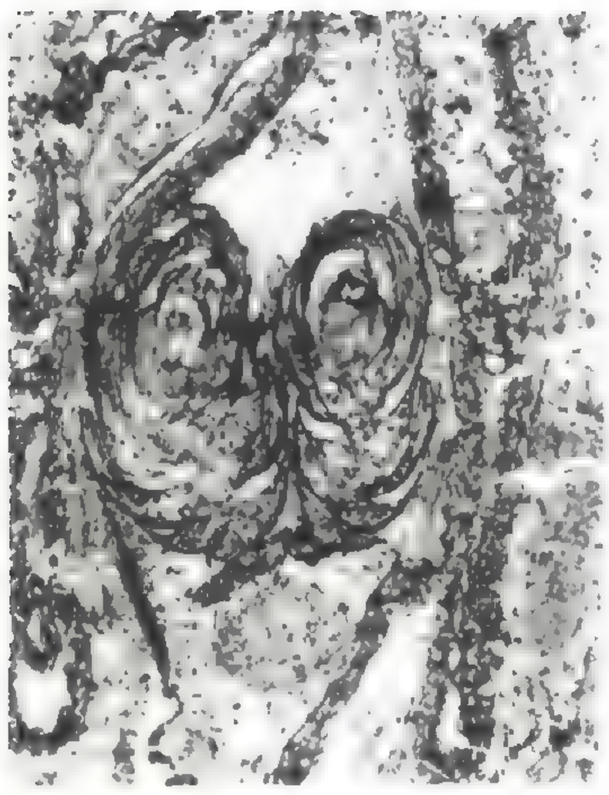

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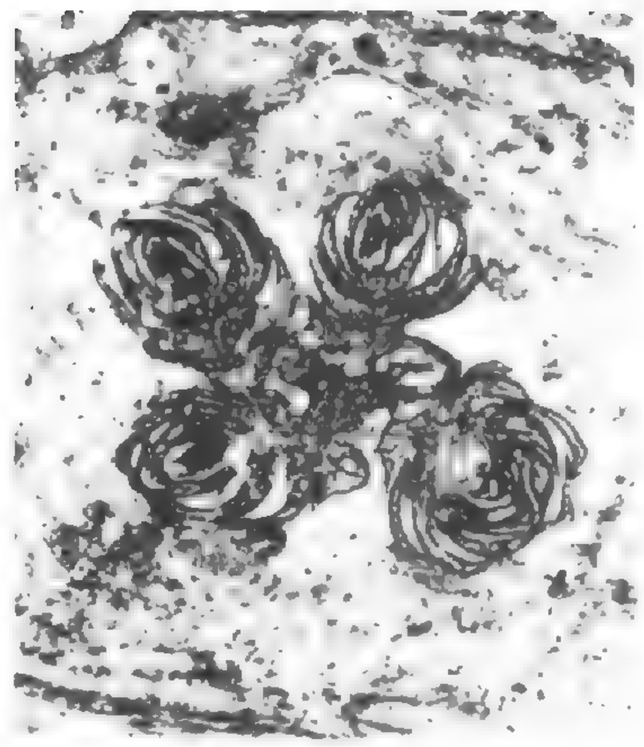

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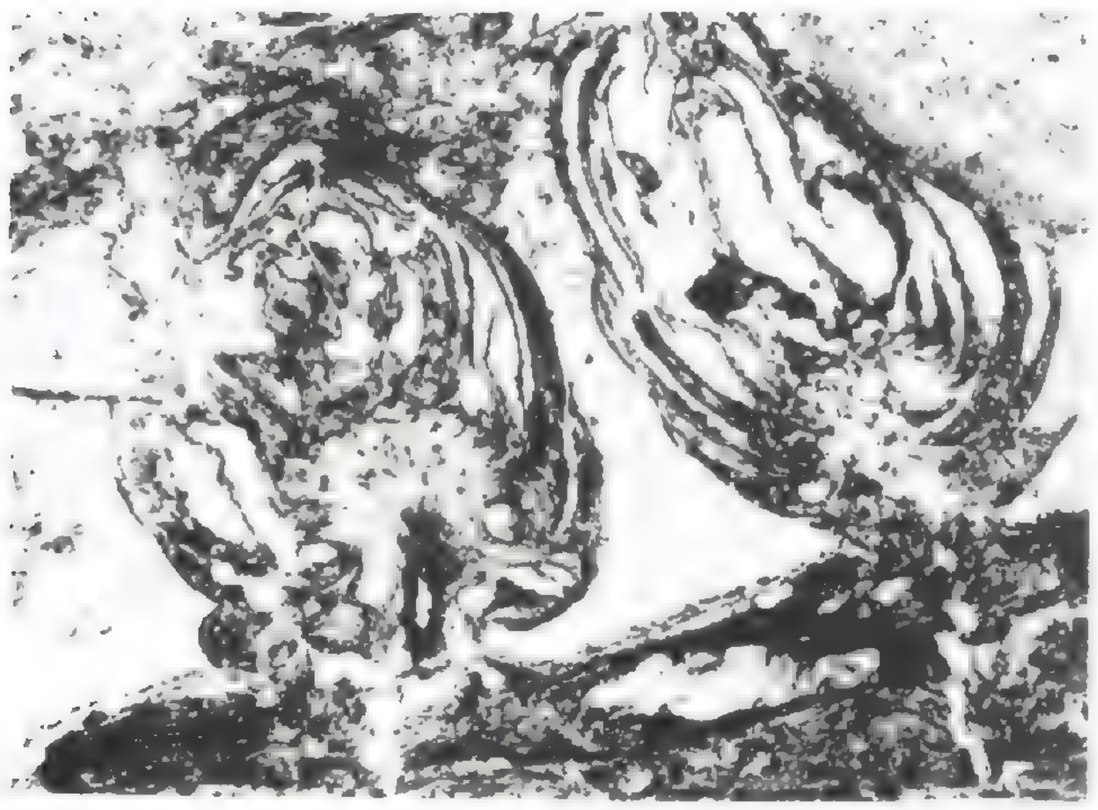

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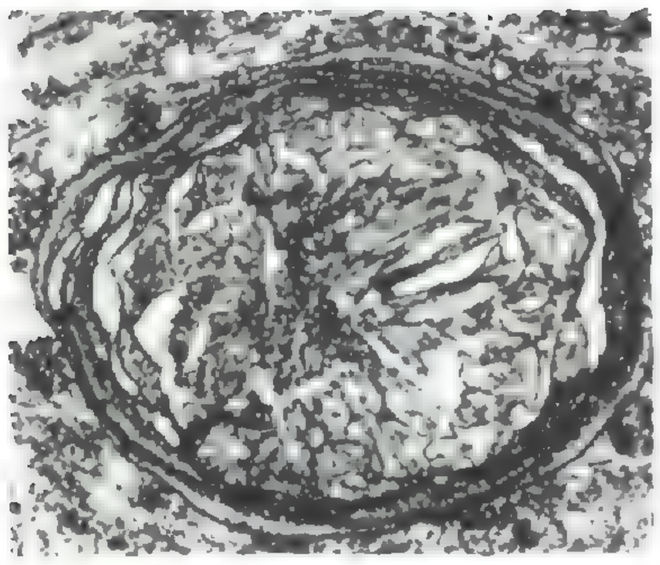

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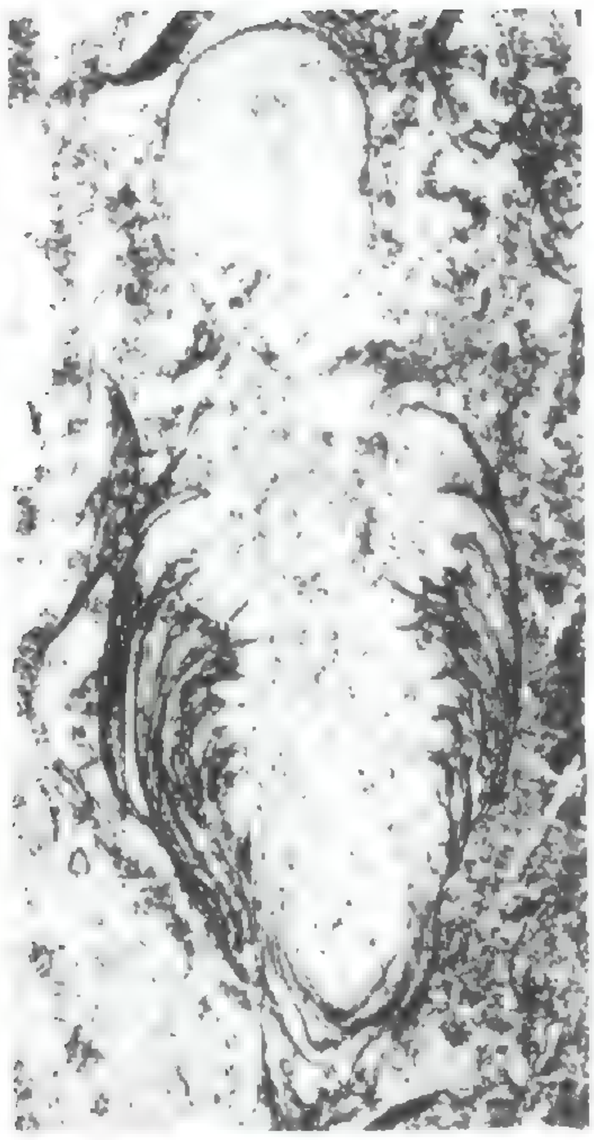

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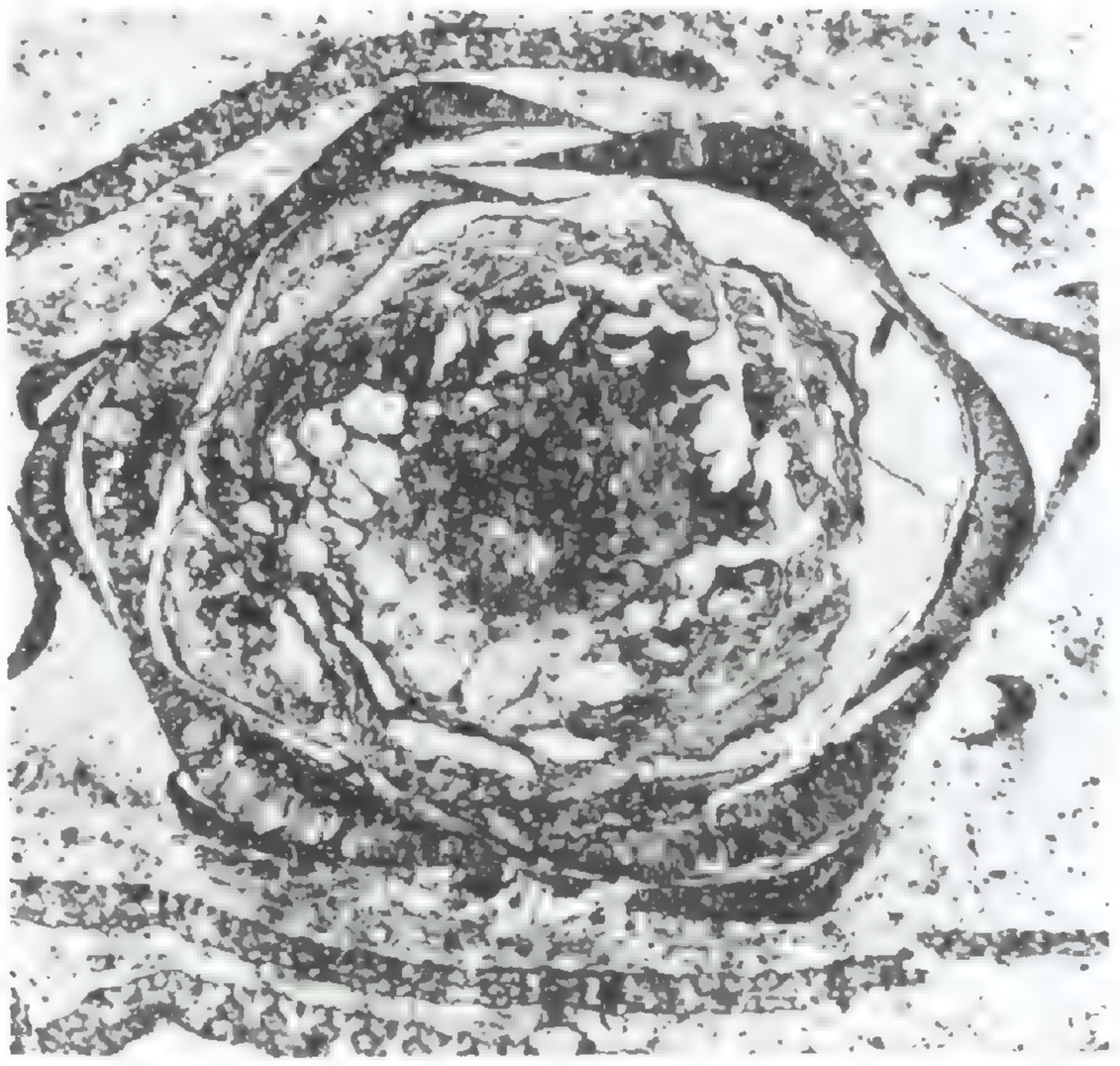

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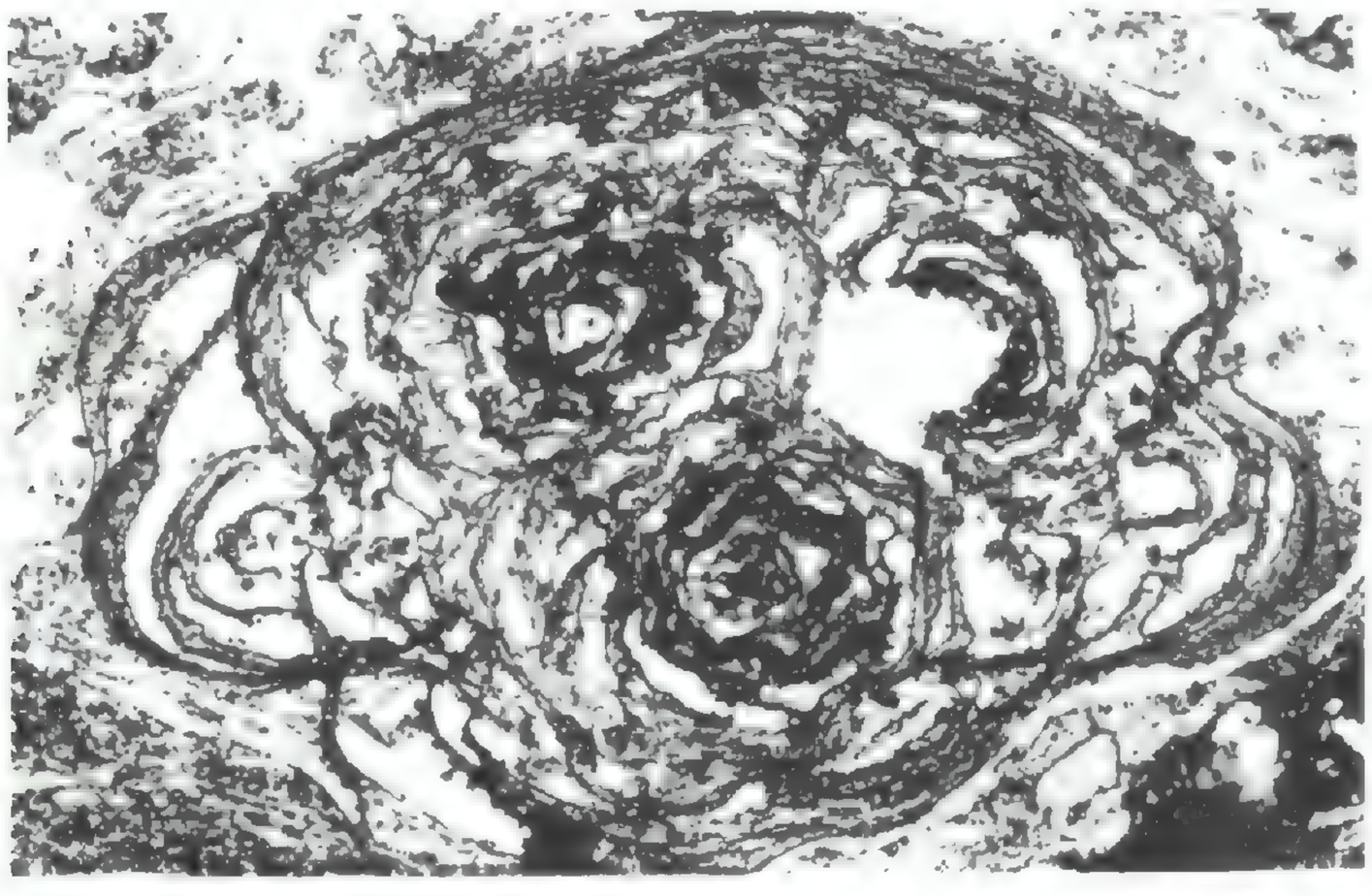

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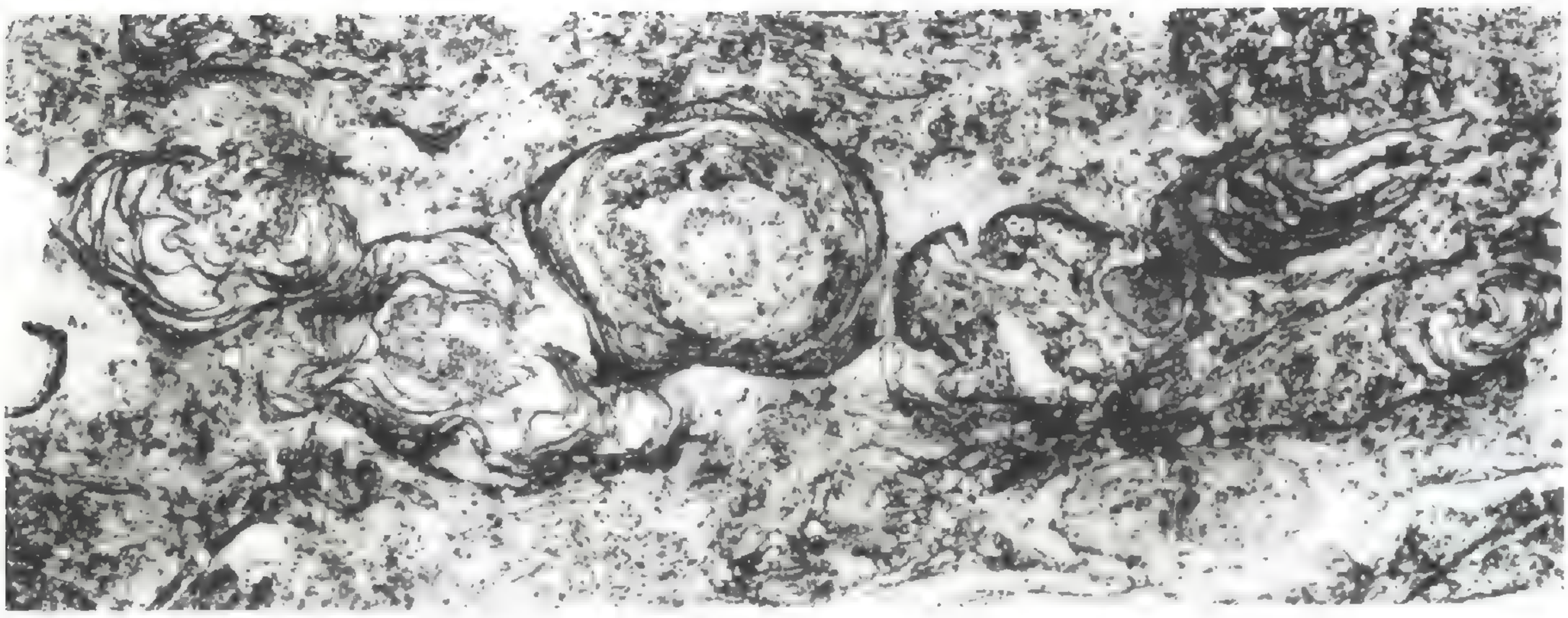

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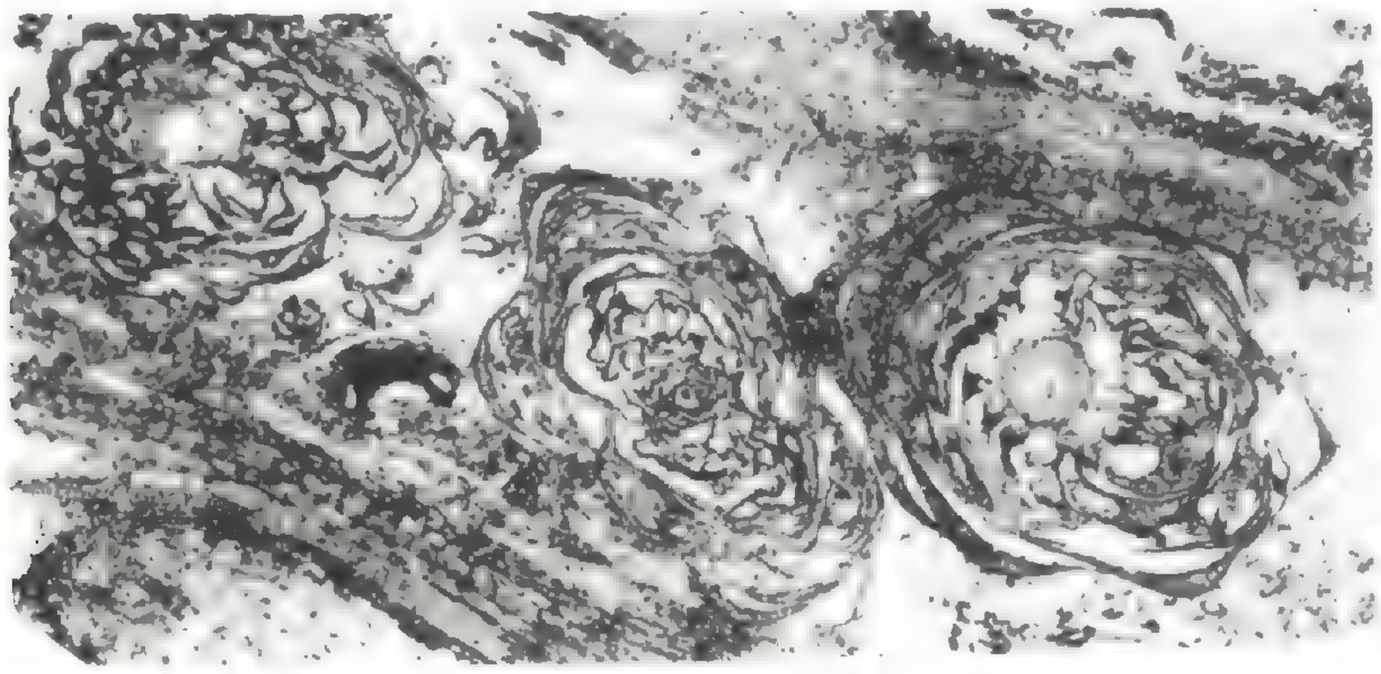

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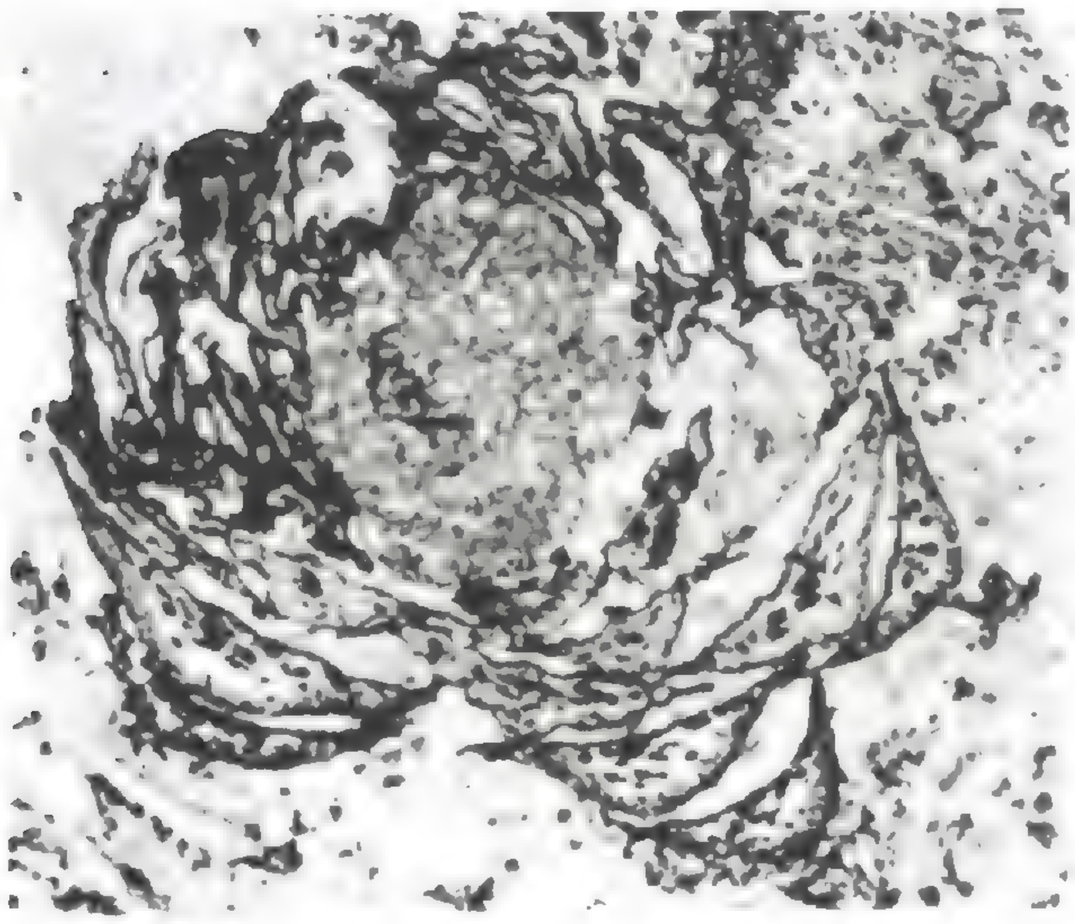

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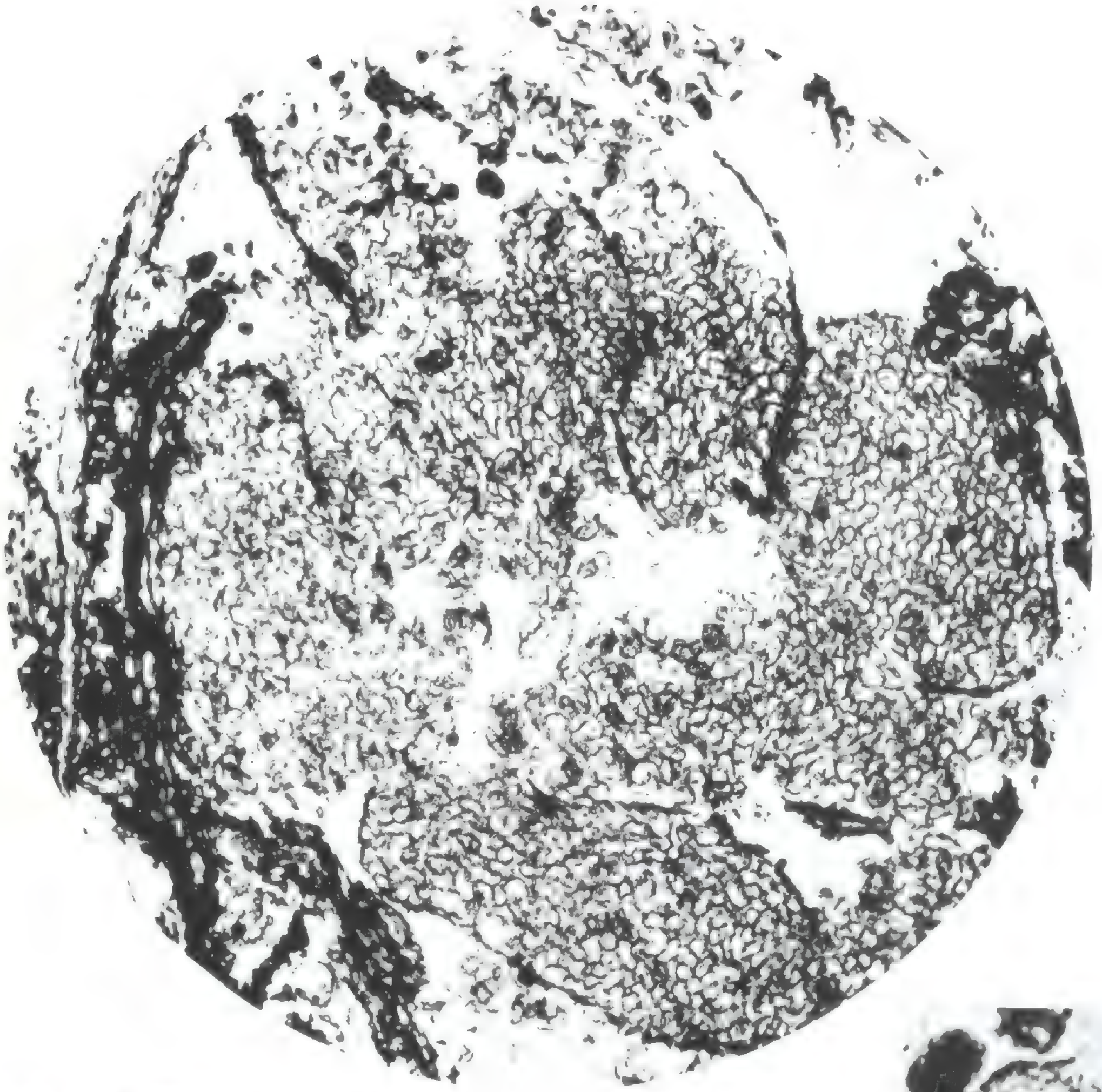

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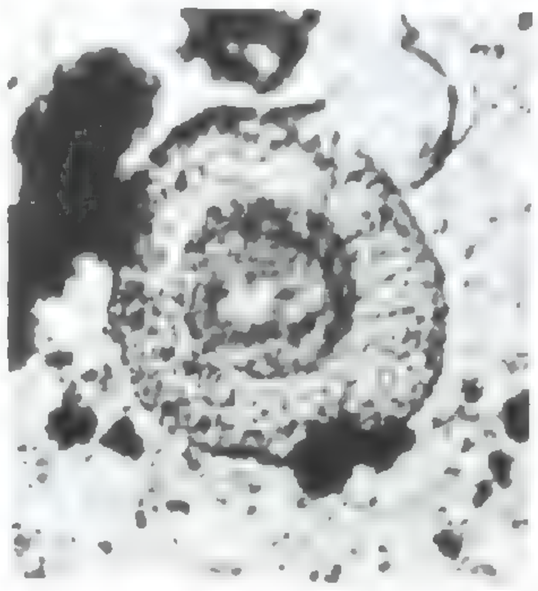

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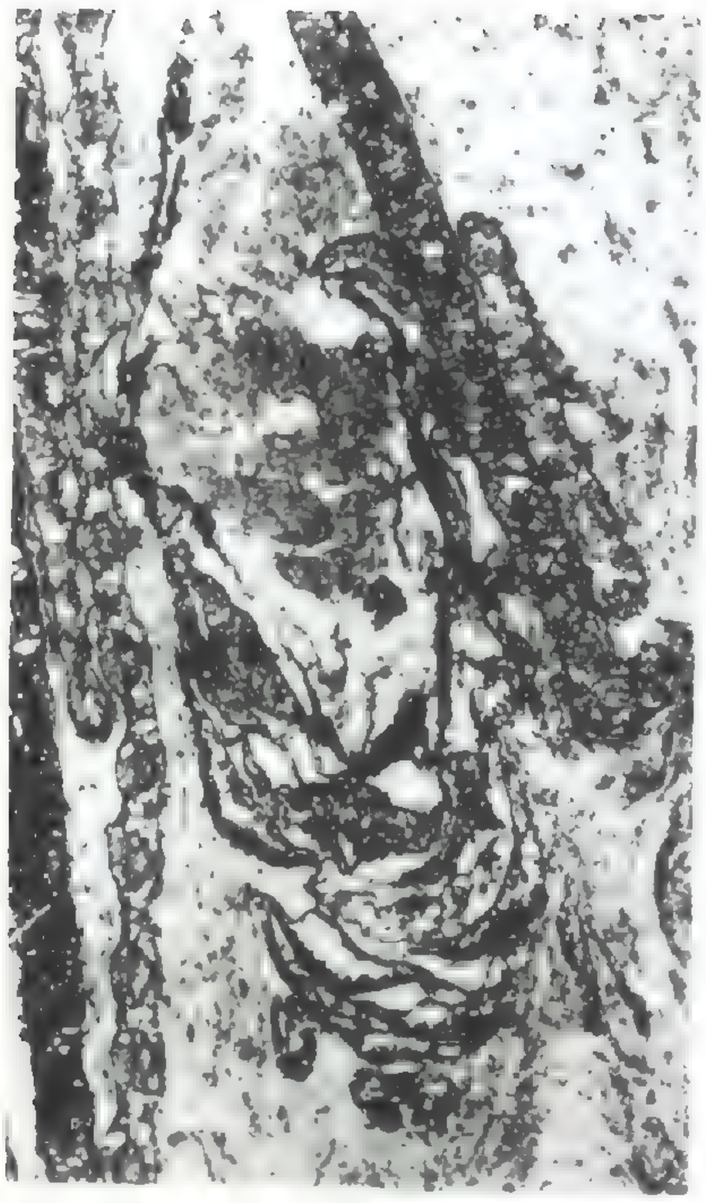

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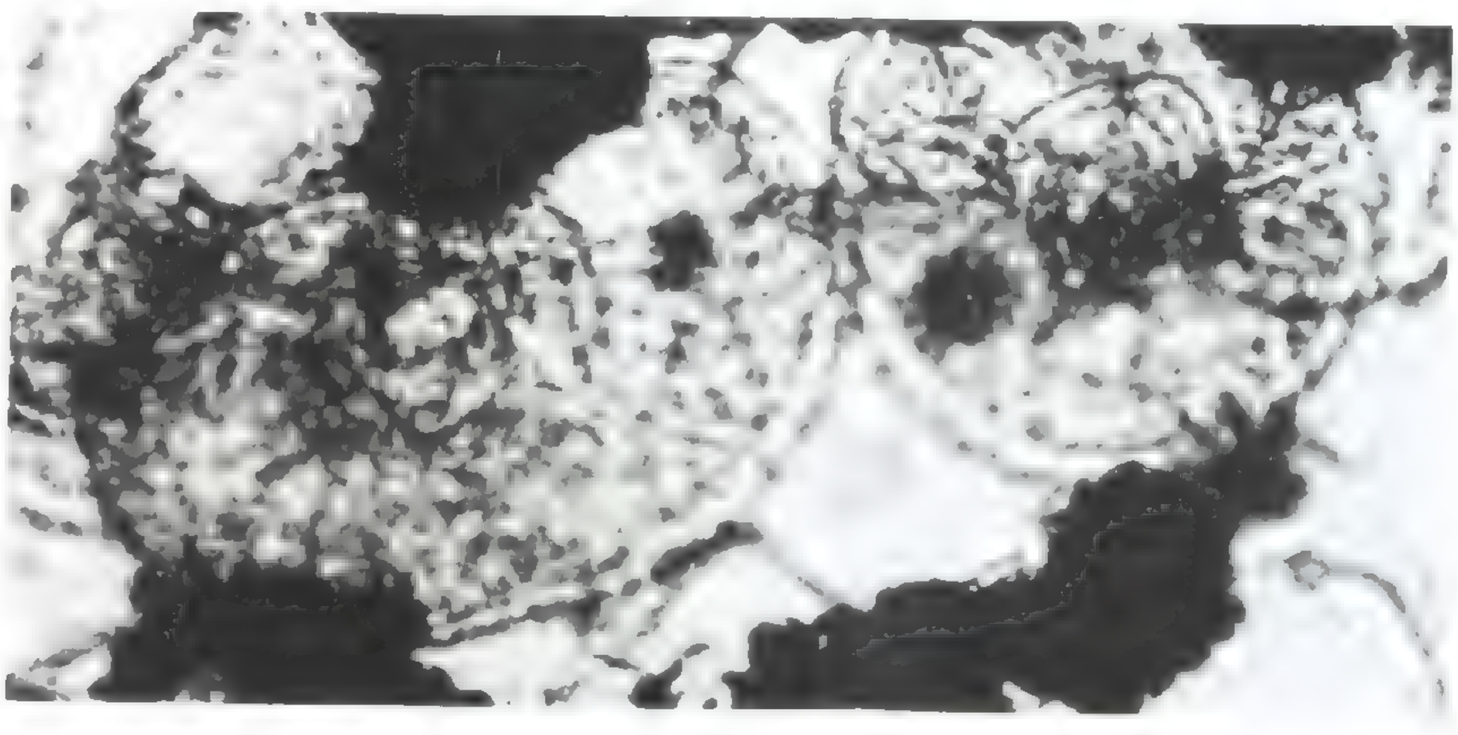

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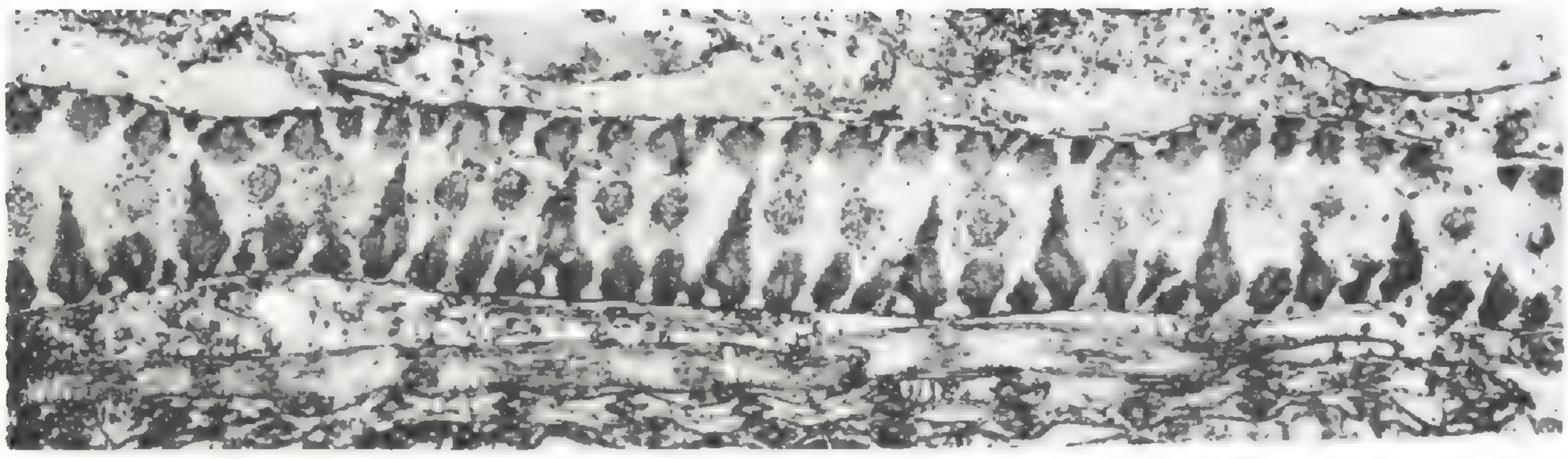

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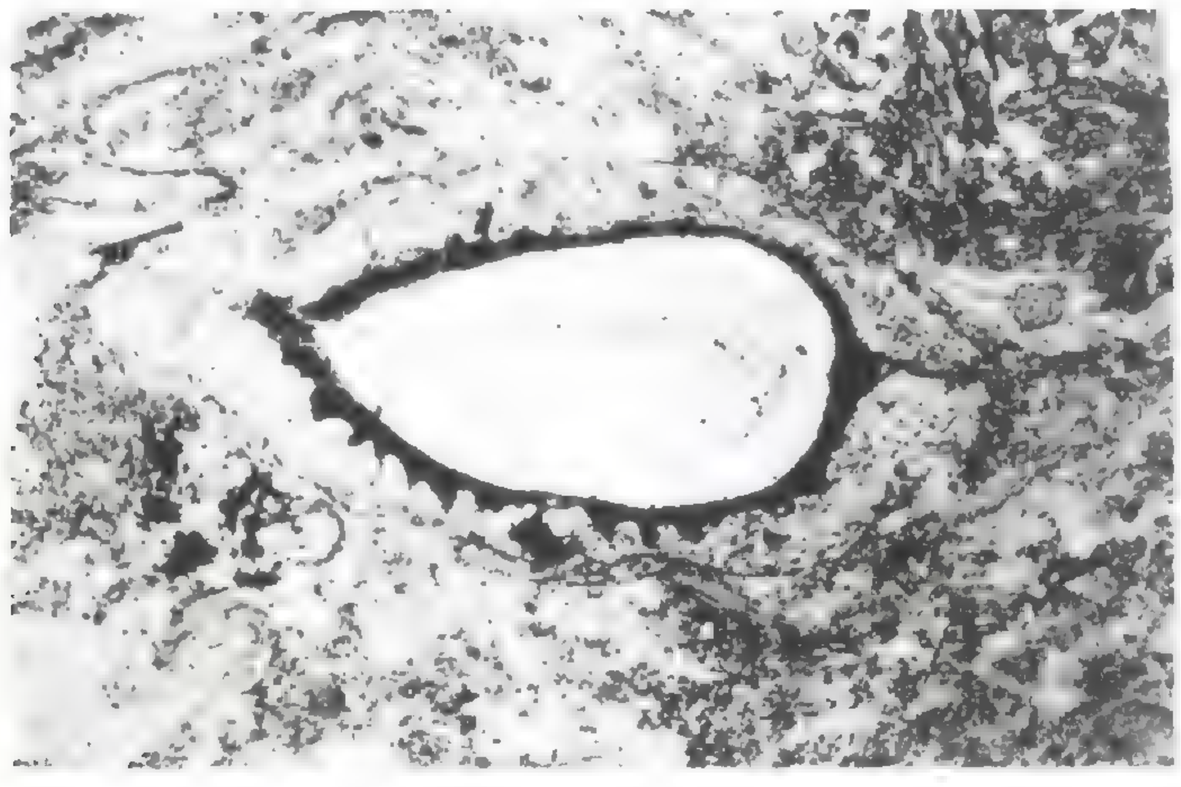

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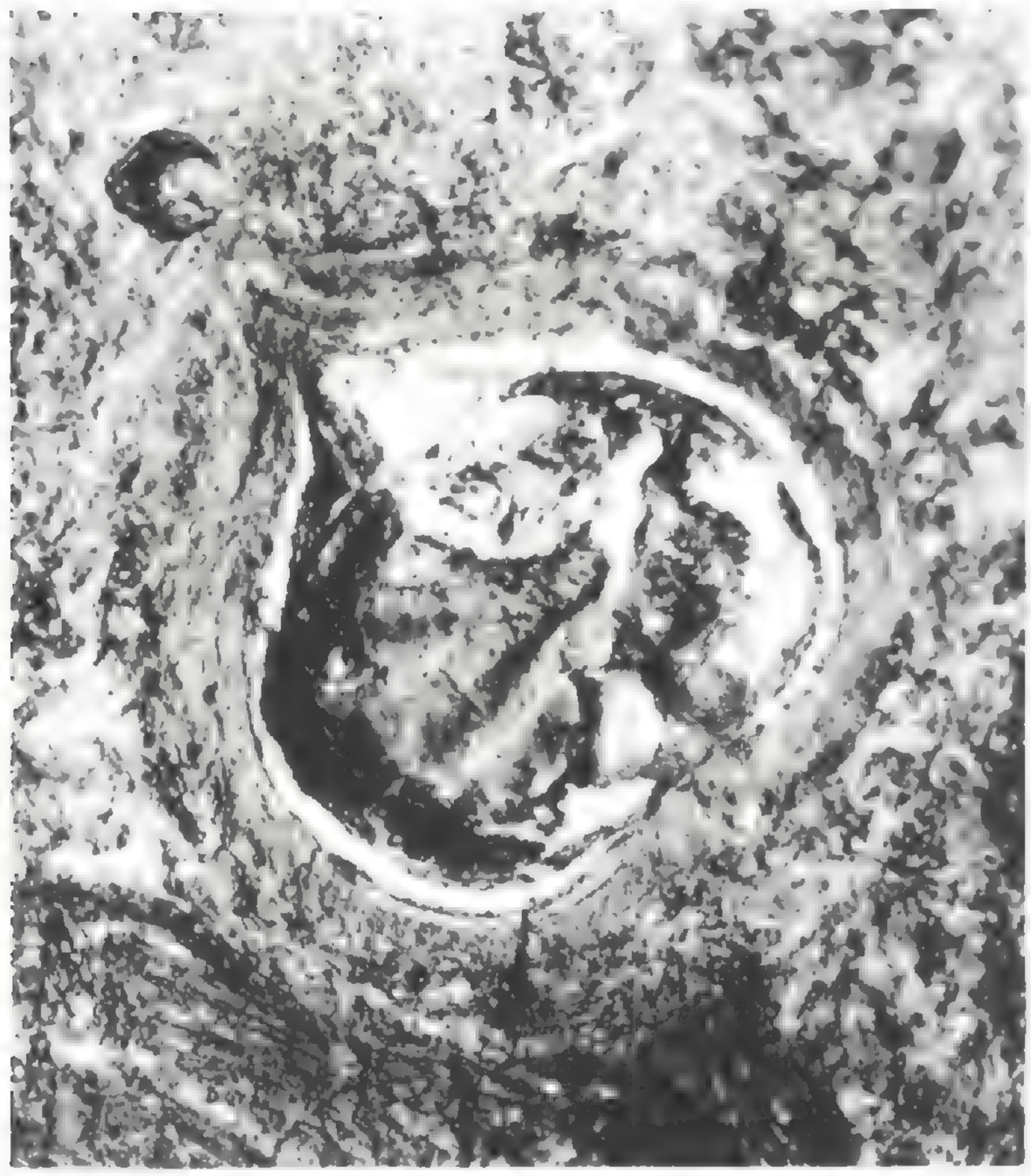

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BOTANICAL MUSEUM LEAFLETS
HARVARD UNIVERSITY

CAMBRIDGE, MASSACHUSETTS, MARCH 1, 1940 VOL. 8, NO. 2

NOTES ON AMERICAN ORCHIDS, INCLUDING NEW SPECIES AND NOMENCLATORIAL CHANGES

BY
CHARLES SCHWEINFURTH

THE following notes, inclusive of the description of new species and changes in nomenclature, have been found advisable in the course of identifying various American collections.

The order of genera follows that of Dr. E. Pfitzer in Engler and Prantl Die natürlichen Pflanzenfamilien.

NOMENCLATORIAL NOTES ON CRANICHIS

The following reductions in Cranichis have been found advisable after a careful study of closely similar concepts.

Cranichis diphylla *Swartz* Prodr. Veg. Ind. Occ. (1788) 120—Cogniaux in Urban Symb. Antill. 6 (1909) 357—Fawcett & Rendle Fl. Jam. 1 (1910) 33.

Cranichis guatemalensis Schlechter in Fedde Repert. 2 (1906) 129.

? Cranichis nigrescens Schlechter in Fedde Repert. 10 (1912) 482.

Cranichis ovatilabia Schlechter in Fedde Repert. Beihefte 7 (1920) 59.

Cranichis Alfredii Schlechter in Fedde Repert. Beihefte 19 (1923) 82.

The only significant difference between *Cranichis guatemalensis* Schltr. (exemplified by type material) and *C. diphylla* Sw. (represented by authentic material) consists of slight but variable discrepancies in the form of the lip. *C. diphylla* has a suborbicular lip and is described by Fawcett and Rendle as "sessile, roundish in outline", while the lip of *C. guatemalensis* is very broadly ovate and is described as shortly unguiculate and ovate-elliptic. However, Cogniaux in Urban Symbolae Antillanae describes the lip of *C. diphylla* as ovate. And moreover, a large series of collections in the Ames Herbarium (identified as *C. guatemalensis*) indicates that this supposed difference is produced largely by varying degrees of expansion of the concave disc. Although the lip of the type of *C. guatemalensis* is unmistakably very shortly clawed and auriculate, this character appears to be variable and often obscure. It follows, therefore, that the two specific concepts are inseparable.

It appears reasonably certain that *Cranichis nigrescens* Schltr. must be regarded as a synonym of *C. diphylla* Sw., but is claimed to be distinct by reason of a pair of impressed-punctate cushions at the base of the ovate lip. However, the lip of *C. diphylla* is described by Fawcett and Rendle as having "2 lateral folds near the base". Moreover, in specimens of *C. diphylla* and *C. guatemalensis* in the Ames Herbarium, such folds with irregular raised projections are often present. Without examining the type of *C. nigrescens*, however, a positive reduction is somewhat questionable.

The Colombian *C. ovatilabia* Schltr. should be regarded as synonymous with *C. diphylla*, as is shown by a drawing of the type made under the supervision of Dr. Schlechter.

Cranichis Alfredii Schltr. from Costa Rica seems to be indistinguishable from *C. diphylla*, since its ovate short-

ly clawed lip is the form seen in typical *C. guatemalensis*. A characteristic of this concept is that the leaves are said to be adorned with white spots on the upper surface.

Other species which are surely closely allied to *C. diphylla* and may prove to be synonymous are the Cuban *C. tenuiflora* Griseb. and the Venezuelan *C. Schlimii* Reichb. f.

In numerous specimens of *C. diphylla* from Costa Rica (in the Ames Herbarium) the flowers are designated as pale greenish, greenish white or white.

Cranichis diphylla Sw., as now delimited, grows in Mexico, Guatemala, Costa Rica and Colombia, as well as in Jamaica and Haiti.

Cranichis Wageneri *Reichenbach filius* in Linnaea 41 (1876) 19.

Cranichis subcordata Schlechter in Fedde Repert. 2 (1906) 130.

Cranichis pilosa Fawcett & Rendle in Journ. Bot. 47 (1909) 265; Fl. Jam. 1 (1910) 33, t. 5, figs. 1–3.

Cranichis costaricensis Schlechter in Fedde Repert. Beihefte 19 (1923) 12.

Cranichis Viereckii Ames in Sched. Orch. 7 (1924) 1.

A specimen of the type collection of the Venezuelan *Cranichis Wageneri* Reichb. f. in the Ames Herbarium shows that the basal leaf is ovate to oblong-ovate (not oblong, as cited in the type description) and that the linear petals are conspicuously long-ciliate, whereas no ciliation is mentioned or shown in a drawing of the type from the Reichenbach Herbarium in Vienna.

Cranichis subcordata Schltr. from Guatemala is described as having leaves reaching only 3.5 cm. in length and 2.8 cm. in width, whereas typical *C. Wageneri* has leaves at least 7.5 cm. long and 3.3 cm. wide. However, there is no noticeable difference in floral characters.

The West Indian *Cranichis pilosa* Fawc. & Rendle from Jamaica and Santo Domingo is apparently indistinguishable from *C. Wageneri*. The leaf-blades are said to vary from 4 to 10 cm. long and from 2.5 to 7.5 cm. wide. Its flowers are said to be "greenish tinted with pink . . . or umber, . . . petals light pink with white hairs or pale reddish-brown, . . . lip white tinted with green outside and pink inside, or white with reddish markings."

The Costa Rican *Cranichis costaricensis* Schltr. does not differ from *C. subcordata* in any significant detail. In the Ames Herbarium are several collections identified as *C. subcordata* in one of which there is a leaf about 11.5 cm. long and 6.2 cm. wide, and the flowers (according to collectors' notes) range from green or greenish white to white.

The Colombian *Cranichis Vierechii* Ames shows no noticeable difference from the other concepts of this category other than in having a smooth rachis.

The most significant variations in this widely extended species appear to occur in a Mexican collection, *Matuda 1807*. In this number the flowers have sepals which are acute rather than acuminate, and the somewhat broader lip has the central vein bifurcate at the apex. Of the two specimens forming this collection, one bearing a short raceme of flowers in good condition is about 34 cm. high. The flowers are slightly larger than usual and the lip is rather more rhombic in outline. The other specimen, bearing old and imperfect flowers, is about 61 cm. high and is thus more than twice as high as any specimens of *C. subcordata* in the Ames Herbarium.

A concept which may prove to be a synonym of this species is *Cranichis Engelii* Reichb. f. from Venezuela. Judging from a drawing of the type sent from the Reichenbach Herbarium, it appears to be very similar to *C. Wageneri*, but differs in having the floral bracts pilose,

the petals obtuse (not acute) and the lip somewhat broader with more numerous branches to the lateral veins.

As now comprehended, *C. Wageneri* Reichb.f. extends from the West Indies and Mexico through several countries in Central America to Venezuela, Colombia, and Peru.

SOME ORCHIDS FROM MEXICO COLLECTED BY E. MATUDA

In a collection of orchids made by E. Matuda in the State of Chiapas, Mexico, from August 1937 to January 1938, occur the following species which are mostly unrecorded from that country. Chiapas adjoins the western boundary of Guatemala and accordingly the occurrence of Guatemalan and even Costa Rican species in the southernmost portion of Mexico is more or less to be expected.

Cranichis diphylla *Swartz* Prodr. Veg. Ind. Occ. (1788) 120.

Synonomy as previously recorded in this paper.

This species, with its various concepts, extends from southern Mexico to Colombia and the West Indies. It is here first recorded from Mexico.

State of Chiapas, "Esquipula, Cero de laguna, Mapastepec. Enero 1938", *E. Matuda 2037*.

Cranichis Wageneri *Reichenbach filius* in Linnaea 41 (1876) 19.

Synonymy as previously recorded in this paper.

Cranichis Wageneri Reichb.f., including its various forms, extends from southern Mexico to Peru and the West Indies. It is here first recorded from Mexico.

State of Chiapas, "Escuintla-Chiapas, Mt. Orando, Ago 31, 1937", *E. Matuda 1807*.

The Matuda collection shows some degree of variation from the usual form. The sepals are acute rather than

acuminate and the somewhat broader and acute lip has the central vein bifurcate at the apex.

Stelis ovatilabia *Schlechter* in Fedde Repert. 15 (1918) 211.

Stelis cyclopetala Schlechter in Fedde Repert. Beihefte 19 (1923) 279.

This species, which was formerly known from Guatemala and Costa Rica, is now reported from southern Mexico.

State of Chiapas, Siltepec, August 8, 1937, *E. Matuda S-222.*

Lepanthes oreocharis *Schlechter* in Fedde Repert. 10 (1912) 483.

This species, heretofore recorded only from Guatemala, is now reported from southern Mexico. One of the two specimens seen is slightly larger vegetatively than the type.

State of Chiapas, Mt. Pasitar, August 3-4, 1937, *E. Matuda 1688.*

Epidendrum cobanense *Ames & Schlechter* in Sched. Orch. 5 (1923) 27, fig. 1.

This species, which has been recorded from Guatemala and Honduras, now appears to come from southern Mexico.

State of Chiapas, "Montecristo, in pine land, 1800 m. Enero 1938", *E. Matuda 1981.*

Eulophia alta *(L.) Fawcett & Rendle* Fl. Jam. 1 (1910) 112, t. 22, figs. 4–8.

Limodorum altum Linnaeus Syst. Nat. ed. 12, 2 (1767) 594.

Eulophia longifolia Schlechter Die Orchideen (1914) 347.

This interesting species extends from Florida and the West Indies to Peru, and is here reported from southern Mexico.

State of Chiapas, "Acacogagua, Escuintla. Ago 20, 1937", *E. Matuda 2058*.

Bulbophyllum pachyrrhachis *(A. Rich.) Grisebach* Fl. Brit. W. Ind. (1864) 613.

Pleurothallis pachyrachis A. Richard in Sagra Hist. Isl. Cub. Segunda Parte Hist. Nat. 11 (Fl. Cub. Fanerog. 2) (1850) 234, t. 74.

This species, reported from Guatemala to Panama and the West Indies, is now known from southern Mexico.

State of Chiapas, "Jalapa" Escuintla, October 31, 1937, *E. Matuda 2055*.

Odontoglossum oliganthum *Reichenbach filius* in Bonplandia 4 (1856) 321; in Gard. Chron. n.s. 11 (1879) 556.

This species was apparently heretofore recorded only from Guatemala. The position of the lip, which seems to spread from the column at a right angle, suggests that it belongs in the genus *Oncidium*.

The Matuda collection differs from the type in possessing five flowers on its peduncle, instead of two to three.

Mexico, State of Chiapas, Paso de Pasitar, August 9, 1937, *E. Matuda 1597*.

DESCRIPTION OF NEW SPECIES AND NOMENCLATORIAL NOTES

Pleurothallis aurita *C. Schweinfurth sp. nov.*

Herba parva, pro subgenere gracilis, caespitosa. Caules basi decumbentes, filiformes, apice monophylli. Folium ellipticum vel elliptico-lanceolatum, coriaceum, apice ob-

tuso minute bilobulatum, sessile. Inflorescentiae in folii axilla fasciculatae, unifforae, vagina conduplicata subtenta. Flores perparvi, bilabiati. Sepalum dorsale ovale, apice rotundatum, trinervium. Sepala lateralia in laminam semiorbicularem, in positu naturali semiurceolatam, omnino connata. Petala minuta, spathulato-oblonga, apice rotundata. Labellum in positu naturali conico-hemisphaericum cum auriculis binis lineari-lanceolatis erectis intus basi callosis praeditum. Columna generis.

Plant small, up to 10 cm. high to the apex of the leaf, caespitose. Roots fibrous, flexuous, whitish, glabrous. Stem filiform, decumbent at base, up to 6.8 cm. long, unifoliate at the apex, covered below the middle with three close tubular imbricating sheaths (the uppermost much the longest) which are evanescent with age. Leaf solitary, elliptic or elliptic-lanceolate, sessile, up to 4 cm. long and 1.2 cm. wide, minutely bilobed and apiculate at the obtuse apex, erect or more commonly spreading, coriaceous, with the mid-nerve generally conspicuously prominent beneath. Inflorescences 1-flowered, fascicled in the axil of the leaf, subtended by an erect conduplicate spathe which is about 1 cm. long. Flowers very small, bilabiate. Dorsal sepal oval, subacute at the rounded apex, about 3.7 mm. long and 2.4 mm. wide, 3-nerved, slightly concave, somewhat carinate through the basal half on the outer surface. Lateral sepals entirely connate into a lamina which is semiurceolate in natural position, when expanded the lamina is semiorbicular, 4-nerved, about 3 mm. long and 4 mm. wide, with the anterior margins somewhat recurved. Petals small, spatulate-oblong, 1-nerved, about 1.6 mm. long and 0.8 mm. wide near the apex which is rounded fleshy and more or less oblique. Lip conic-hemispherical in natural position, about 1.5 mm. long and 1 mm. wide, 3-nerved, apiculate; at the base there is a pair of erect linear-lanceolate, slight-

ly sigmoid auricles about 1.8 mm. long, furnished inside at the base with a large tuberculate ovoid callus (the calli of the parallel auricles contiguous). Column short, stout, dorso-ventrally complanate, about 1.5 mm. long.

Pleurothallis aurita is allied to *P. concaviflora* C. Schweinf., but is dissimilar in having shorter blunter sepals, spatulate-oblong petals and lip with a pair of long basal auricles. It differs from *P. saccatilabia* C. Schweinf. in its much smaller petals and elongate basal auricles of the lip.

Costa Rica: vicinity of El General, Province of San José, at 1100 meters altitude, flowers yellow, November 1936, *Alexander F. Skutch 2941* (Type in Herb. Ames 55415).

Pleurothallis Broadwayi *Ames* Orch. 2 (1908) 267.

Pleurothallis guadalupensis Cogniaux in Urban Symb. Antill. 6 (1909) 432.
Pleurothallis Williamsii Ames Orch. 7 (1922) 120.

Pleurothallis guadalupensis, of which we have a specimen of the type number, seems to be inseparable from *P. Broadwayi*. In the latter species, the stems were claimed by Cogniaux (l.c. p. 397) to be monophyllous; but the type collection in the Ames Herbarium, while commonly showing monophyllous stems, often bears two or three leaves on a single stem. On the other hand, *P. guadalupensis* is claimed to have two or three leaves on a stem but is said to be rarely monophyllous (as in our examples of the type collection). Moreover, the shape of the leaves in the two species is practically identical and there appears to be no noteworthy difference in the floral parts of the two concepts. In particular the lip of *P. Broadwayi*, which is described as trilamellate, is in reality strongly 3-nerved with only two conspicuous keels, as in *P. guadalupensis*. In outline also the lip of *P. Broadwayi* might

be described as "leviter trilobatum" as designated for *P.guadalupensis.*

Pleurothallis Williamsii from Panama is somewhat larger than *P. Broadwayi* both vegetatively and florally (especially with respect to the petals), but there seem to be no striking morphological differences between the two concepts. Moreover, there occur in Honduras and in Costa Rica plants closely similar to *P. Williamsii* and somewhat intermediate in character between it and *P. Broadwayi.*

A closely allied species is the Costa Rican *P. nana* A. & S., which differs in having longer narrower sepals and a smaller lip. Moreover, judging from the description and floral analysis of the type, the Colombian *P. lepanthoides* Schltr. seems to belong to this alliance.

Pleurothallis Broadwayi appears to be variable in the number and size of the leaves, in the size of the flowers and in the proportion of the petals.

In its present interpretation, *Pleurothallis Broadwayi* extends from Honduras (*J.B.Edwards 546, 599*), Costa Rica (*C.H.Lankester 1207, A.M.Brenes (3) 1484, Austin Smith H 541*) and Panama (*R.S.Williams 976*, type of *P. Williamsii*) to Cuba (*Luna 524*), Guadeloupe (*Duss 4192*, type of *P.guadalupensis*), Martinique (*H.Stehlé 2139*), Grenada (*W.E.Broadway 1846*, type of *P. Broadwayi*) and Venezuela, Island of Margarita (*J.R.Johnston 237*).

Pleurothallis Broadwayi *Ames* var. **tricarinata** *C.Schweinfurth var. nov.*

Haec varietas pedicellis longis et labello trilamellato et columna exalata a specie est separata.

A Costa Rican variety of this widespread and variable species is characterized by the longer pedicels of the generally fractiflex raceme, by the presence of a central keel between the lateral ones below the very fleshy apex of the lip and by the absence of distinct wings at the apex of the column.

Costa Rica: epiphyte in moss on tree trunk at edge of forest in semi-shade, Palmira, Canton Alfaro Ruiz, Province of Alajuela, at 2200 meters altitude, buds lemon yellow, May 9, 1938, *Austin Smith H 532;* at 2400 meters altitude, buds pale greenish yellow, flowers pale lemon, petals [?] glandular, May 16, 1938, *A. Smith H 589;* epiphyte on oak, at 2000 meters altitude, flowers cream-yellow with glandular spots, scape pale brown, May 27, 1938, *A. Smith H 668* (Type in Herb. Ames No. 55421): "Arbres des pâturages à Palmira de Alfaro Ruiz, alt. 1840 [meters], 4-vii-1925, *A. M. Brenes (121) 1325.*"

Pleurothallis saccatilabia *C. Schweinfurth sp. nov.*

Herba parvula, caespitosa. Radices numerosae. Caules filiformes, unifoliati. Folium anguste ellipticum vel oblongo-lanceolatum, apice minute tridenticulatum, basi sessile, valde coriaceum. Inflorescentiae axillares, uniflorae. Flos parvus, carnosulus, bilabiatus. Sepalum dorsale rotundato-ovatum, concavum, subacutum. Sepala lateralia in laminam suborbicularem concavam connata. Petala cuneato-spathulata. Labellum in positu naturali anguste triangulare, basi utrinque retrorse triangulari-auriculatum, medio valde saccatum. Columna brevissima, crassa.

Plant small, caespitose. Roots fibrous, numerous, glabrous, forming dense mats. Stems filiform, up to 5 cm. long, mostly arcuate-spreading with the lower part concealed by one or more close tubular evanescent sheaths. Leaf solitary, narrowly elliptic to oblong-lanceolate, up to about 5.3 cm. long and 1 cm. wide, obtuse with a minutely tridenticulate apex, sessile at the cuneate or subrounded base, thickly coriaceous, in the dried specimen often incurled and commonly forming an obtuse angle with the stem. Inflorescences fascicled in the axil of the leaf, 1-flowered, subtended by a conduplicate spathe. Flower small, distinctly pedicelled, bilabiate, rather fleshy. Dorsal sepal round-ovate, about 4.2 mm. long and 4 mm. wide, subacute, concave, 3-nerved. Lateral sepals connate

into a subrotund concave lamina which is about 4.5 mm. long and 5 mm. wide, 4-nerved, minutely bidenticulate at the broadly rounded apex. Petals oblanceolate-spatulate, 3 mm. long, about 1.9 mm. wide near the rounded apex, 1-nerved with the nerve depressed on the upper surface and carinate beneath. Lip narrowly triangular in natural position with the center deeply concave and the fleshy sides erect, triangular-auriculate on each side at the base, about 2.1 mm. long and 2 mm. wide across the retrorse auricles, obtuse, about 1.1 mm. deep across the abruptly inflated middle. Column very short and stout.

Pleurothallis saccatilabia differs from *P. excavata* Schltr. in having much smaller sepals and lip, and larger petals which are not oblong. From *P. concaviflora* C. Schweinf., it differs in having spatulate (not linear) petals and a less concave lip.

MEXICO: Mt. Ovando, Chiapas, at 1250-2370 meters altitude, flower violet, July 1938, *E. Matuda 2546* (TYPE in Herb. Univ. Mich. DUPLICATE TYPE in Herb. Ames No. 55742).

Isochilus linearis *(Jacq.) R. Brown* in Aiton Hort. Kew. ed. 2, 5 (1813) 209—Cogniaux in Martius Fl. Bras. 3, pt. 5 (1898) 3, t. 1.

Epidendrum lineare Jacquin Select. Stirp. Amer. (1763) 221, t. 131, fig. 1.

Cymbidium lineare Willdenow Sp. Pl. 4 (1805) 97.

Leptothrium lineare Kunth ex Steudel Nomencl. ed. 2 (1840) 32.

Isochilus leucanthus Rodriguez Gen. & Sp. Orch. Nov. 1 (1877) 47.

Isochilus linearis R. Brown var. *β. leucanthus* Cogniaux in Mart. Fl. Bras. 3, pt. 5 (1898) 4.

Isochilus Langlassei Schlechter in Fedde Repert. 16 (1920) 442.

From a careful study of a drawing of the type of

Isochilus Langlassei with floral analyses made under the direction of Dr. Schlechter and an actual fragment of the type number in the Ames Herbarium, it appears to be the wise course to reduce this concept to the synonymy of the widespread *I. linearis*. While it is described as a smaller plant than *I. linearis*, the leaves of *I. Langlassei* (in the duplicate type) are up to 3.6 cm. long and well within the length of those of *I. linearis* as described from the West Indies and Brazil and are closely similar to the leaves of *Epidendrum lineare* as figured by Jacquin. The floral parts of *I. Langlassei* closely approximate those represented by Cogniaux for the Brazilian form of *I. linearis*.

Hexadesmia falcata *C. Schweinfurth sp. nov.*

Herba epiphytica, pro genere magna. Caulis e rhizomate lignoso probabiliter exoriens, inferne teres et pluriarticulatus, superne in pseudobulbum fusiformem dilatatus, apice bifoliatus. Folia elliptica vel oblongo-elliptica, sessilia. Inflorescentiae axillares, perbreves, pauciflorae; bracteae distichae, imbricatae, conduplicatae. Flos ringens, carnosus. Sepala petalaque columnam circumdantia. Sepalum dorsale lanceolato-oblongum, valde concavum. Sepala lateralia oblongo-lanceolata, falcata, leviter navicularia, basi saccata. Petala falcata, lanceolato-oblonga, saepe supra medium latiora. Labellum in positu naturali dimidio basali columnae parallelum et parte anteriore valde decurvata, vi extensum in circuitu obovatum, supra medium leviter trilobatum, apice retusum. Columna arcuata. Anthera hemisphaerica; pollinia sex.

Plant epiphytic, about 30 cm. or more tall to the apex of the spreading leaves. Roots fibrous, glabrous. Stems apparently rising from a woody rhizome, 19–23 cm. or more tall, subterete, concealed by the fibres of sheaths

below, 9- to 10-jointed, terminating above in a narrowly ellipsoid or fusiform pseudobulb which is 5.8–8.1 cm. long and bifoliate at the apex. At the proximal end of the rhizome is a short (immature) stem of similar character to the mature stem which is entirely concealed by distichous imbricating sheaths (necessarily broader where covering the terminal pseudobulbous portion) with spreading recurved apices. Leaves two, elliptic to oblong-elliptic, 11.5–21.2 cm. long, about 3.5–5 cm. wide, cuneate below, obtuse with a minutely bilobed and apiculate apex, with the mid-nerve conspicuously sulcate on the upper surface and carinate beneath, chartaceous in the dried specimen. Inflorescences short, axillary, few-flowered, decurved racemes which are apparently subumbellate. Floral bracts distichously imbricating, loose, conduplicate, apparently suborbicular to ovate-elliptic when expanded. Flowers rather large for the genus, apparently ringent in natural position, somewhat fleshy. Dorsal sepal and petals apparently connivent to form a hood surrounding the column. Dorsal sepal oblong or lanceolate-oblong, strongly concave, subacute, about 14.2–15 mm. long and 4–5 mm. wide when spread out. Lateral sepals falcate-oblong-lanceolate, lightly navicular, saccate at the base, more or less spreading, about 12.4 mm. long from the posterior margin at the base to the apex, up to 4.7 mm. wide near the oblique base when expanded, acute. Petals oblanceolate-oblong or lanceolate-oblong, falcate, acute or minutely and sharply retuse, concave and incurved above, obliquely rounded at the base, about 12.5 mm. long and 4–4.5 mm. wide. Lip in natural position with the basal portion erect and parallel to the column and the anterior part abruptly decurved; disc when forcibly spread out obovate in outline, shallowly retuse, distinctly 3-lobed above the middle, about 12–12.9 mm. long in the middle and 9 mm. wide across the lateral lobes when expanded,

with the margins of the anterior half minutely erose-crenulate and the entire longitudinal central portion more or less fleshy-thickened; lateral lobes shallowly semiobovate; mid-lobe subquadrate, broader than long, about 3.4 mm. long in the middle and 6–6.3 mm. wide at the broader base. Column about 8–9 mm. long measured on the dorsal surface, slightly arcuate, semiterete in section with the anterior surface concave; clinandrium 3-lobed, lateral lobes broadly rounded, mid-lobe incurved and bluntly triangular. Anther hemispherical, 2-celled, each cell with three divisions; pollinia 6, complanate-ovoid or complanate-pyriform.

Hexadesmia falcata is apparently allied to *H. bifida* Reichb.f. (of which we have an analytical drawing from the Reichenbach Herbarium), but differs by the elongate many-jointed stem, by the relatively smaller pseudobulb, and by the much larger flowers. *Hexadesmia fasciculata* Brongn. has narrower and less falcate perianth segments and a lip which is not definitely 3-lobed.

COSTA RICA: epiphyte rooted in moss on lateral limb of pasture tree in the semi-shade of the Caribbean cloud forest, Zapote, Canton of San Carlos, Province of Alajuela, at 1400 meters altitude, "foliage flat; thinly coriaceous; semi-rigid 1 or 2 sessile blades from bulb. . . sepals & petals pale lime green; lip light yellow green; some obscure violet lines," August 17, 1938, *Austin Smith H 1095* (TYPE in Herb. Ames No. 55744): Cachi, at 900 meters altitude, "flor verduzca," April 18, 1938, *Manuel Valerio 2576*. (Large and advanced specimen).

Epidendrum cordiforme *C. Schweinfurth sp. nov.*

Herba parvula, superne praesertim multo ramosa, late patens. Caules tenues, vaginis pustulosis fere omnino obtecti. Folia parva, disticha, saepe subopposita, elliptico-oblonga vel ligulata, in vivo carnosa, in sicco saepe conduplicata et arcuata, apice rotundato-bilobulata. Inflorescentiae saepissime uniflorae, subsessiles. Sepala oblonga vel elliptico-oblonga, acuta vel mucronata. Petala

spathulato-oblanceolata vel anguste oblanceolata. Labellum simplex; lamina columnae adnata et columnam circumdans, late cordata, acuminata, valde concava, nervis conspicuis ornata, marginibus anterioribus utrinque involutis ut apex rostriformis appareat. Columna parva.

Plant small, much branched especially above, up to 14.5 cm. tall, widely spreading, sometimes arcuate. Roots fibrous, flexuous, glabrous, commonly numerous, issuing from the base and lower parts of the stems. Stems entirely or mostly concealed by densely pustulose leaf-sheaths which are more or less evanescent in age. Leaves small, numerous, spreading, distichous, often subopposite, elliptic-oblong to linear, up to 2.1 cm. long including the very short petiole, up to 4.5 mm. wide (blade preserved in alcohol), fleshy, commonly more or less arcuate and conduplicate in the dried specimen, abruptly bilobed at the apex with nearly equal rounded lobules. The living leaf-blade is apparently very fleshy, with the mid-nerve longitudinally sulcate above so that the upper surface is concave and the lower surface convex. Inflorescences terminal, commonly 1-flowered (very rarely 2-flowered), subsessile with a very short recurved peduncle. Pedicel concealed by a pustulose infundibuliform bract. Perianth rigid-nervose, with the parts widely spreading. Dorsal sepal oblong or elliptic-oblong, sometimes slightly broader above the middle, about 8–10.5 mm. long and 2–2.6 mm. wide, acute or dorsally mucronate at the apex, 7- to 11-nerved below the middle. Lateral sepals elliptic-oblong or oblong-lanceolate, slightly asymmetric, about 8–10 mm. long and 2.5–2.9 mm. wide, dorsally mucronate at the apex, 7- to 11-nerved below the middle. Petals spatulate-oblanceolate or narrowly oblanceolate, 7–9 mm. long, 2–2.7 mm. wide above the middle, acute or subacute, 3-nerved to near the apex or 5-nerved below the middle, sometimes minutely bulbose-thickened at the

base within. Lip adnate to the column near the middle of the column; lamina simple, rotundate-cordate or cordate-ovate, concave, ecallose, with radiating thickened nerves of which the three median nerves are commonly the most prominent and the middle nerve is exserted on the lower surface and extends as a keel to the acuminate apex, about 6–8 mm. long from the junction with the column and 6–8.4 mm. wide near the cordate base, with the anterior margins on each side usually involute thus forming an abruptly long-acuminate or rostrate apex. Column short, stout, gradually dilated above, up to about 2 mm. long on the dorsal surface in the middle, slightly longer on the sides. Pollinia four, strongly complanate, ellipsoid, rounded or obovoid.

The collection *A. Smith H 1092*, while obviously belonging to this species, bears immature flowers with rather smaller perianth segments and narrower lip than typical.

Epidendrum cordiforme differs from *E. fundi* Ames in having pustulose leaf-sheaths and in having dissimilar sepals, petals and lip. It has commonly solitary flowers and larger perianth than *E. microcardium* Schltr. It is much smaller in every respect than *E. exile* Ames.

Costa Rica: epiphyte in moss on living tree in semi-shade within Caribbean cloud forest zone, Palmira, region of Zarcero, at 6000 feet altitude, flowers pale old gold changing to dull pinkish russet in mature state, about 14 mm. long and broad when expanded, September 27, 1937, *Austin Smith A 458* (Herb. Field Mus. No. 941812); same habitat in subtropical zone at Palmira, Province of Alajuela, Canton Alfaro Ruiz, at 2200 meters altitude, "the very pale greenish-yellow [sepals] tipped obscure dusky violet: the basal part of bud (as well plant stems) with purplish glands. fl. opening campanulate-pale yellowish or even cream color", August 10, 1938, *Smith H 1092*; same habitat and locality as *H 1092*, semi-decumbent, "fls. plain sulphine yellow," September 2, 1938, *Smith H 1163*; same locality as the last, on tree trunk in open woodland in semi-shade, at 1900 meters alti-

tude, in subtropical zone, stem up to 15 cm. tall, "fls. sulphine yellow to buffy yellow", October 4, 1938, *Smith H 1247* (TYPE in Herb. Ames No. 55372): El Gallito, at 1900 meters altitude, "Flor amarillo pálido, 30-10-38", *Manuel Valerio 2665*.

Hofmeisterella eumicroscopica *Reichenbach filius* in Walp. Ann. 3 (1852) 563; in Xen. Orch. 1 (1854) 41, t. 18, figs. I, II, 1–8.

Hofmeistera eumicroscopica Reichenbach filius De pollinis Orch. genesi ac struct. (1852) 30.

In the description and floral analysis (in Xen. Orch. l.c.) it is indicated that the flower of this species has two pollinia, whereas a flower from *J. F. Macbride 3774* shows four pollinia (one pair of large pollinia and one pair of small ones in front of the larger).

This genus, which is at present monotypic, was found by Warscewicz at Loxa in Ecuador at about 9000 feet altitude. In addition, we now have it from Peru (Yanano, about 6000 feet altitude, *J. F. Macbride 3774* and Valle de Santa Ana, Prov. de la Convención, *F. L. Herrera 3007*) and from Venezuela (Tabay, Mérida, at about 5400–6600 feet altitude, *Gehriger 451*).

Oncidium ansiferum *Reichenbach filius* in Bot. Zeit. 10 (1852) 696; in Hamb. Gartenzeit. 13 (1857) 315; in Xen. Orch. 1 (1858) 232, t. 98, figs. I, II, 1—Lindley Fol. Orch. Oncidium (1855) p. 47—Kränzlin in Engler Das Pflanzenr. IV. 50, pt. 2 (Heft 80) (1922) 272, fig. 22 G, a-d.

Oncidium ensatum Hort. Berol. ex Reichenbach filius in Xen. Orch. 1 (1858) 232, in synon., non Lindl.

Oncidium hieroglyphicum Hort. Berol. ex parte ex Reichenbach filius in Xen. Orch. 1 (1858) 232, in synon.

Oncidium Lankesteri Ames in Sched. Orch. 4 (1923) 53.

The concept *Oncidium Lankesteri*, which is a frequent and rather variable species of the higher levels of Costa Rica, seems to be inseparable from *O. ansiferum* as represented in our herbarium by a fragment from the type in the Reichenbach Herbarium in Vienna, as well as by an analytical drawing of the flower etc. made by Reichenbach from this type and a photographic record of typical material in the Lindley Herbarium at Kew.

The pseudobulb represented in the analytical drawing of the type made by Reichenbach is oval or round-ovate in outline (very similar to that of the concept *O. Lankesteri*), and not oblong as described by Reichenbach (in Xen. Orch. l.c.). In view of the above-cited records of the type, the drawing of the lip in Xenia is also faulty. Considerable variability exists in this species in regard to vegetative and floral size and in the degree of toothing on the wings of the column.

The type of *O. ansiferum* from Panama (Chiriqui) was found at 8000 feet, while the form described as *O. Lankesteri* occurs at altitudes varying from 3000 to 7000 feet.

Allied species are represented by *Oncidium suave* Lindl., *O. Suttonii* Batem. ex Lindl. and especially by *O. naranjense* Schltr. All of these species, however, differ from *O. ansiferum* in the form of the lip.

Oncidium tigrinum *La Llave & Lexarza* Nov. Veg. Descr. fasc. 2 (1825) 36.

Oncidium Barkeri Lindley in Bot. Reg. 27 (1841) Misc. p. 81.

Odontoglossum Ghiesbreghtianum A. Richard & Galeotti in Ann. Sci. Nat. ser. 3, 3 (1845) 27.

Oncidium unguiculatum Lindley in Journ. Hort. Soc. London 1 (1846) 303, cum ic.

Odontoglossum tigrinum Lindley Fol. Orch. Odontoglossum (1852) p. 5.

Oncidium ionosmum Lindley in Gard. Chron. (1853) 726.
Oncidium tigrinum La Llave & Lexarza (B) *unguiculatum* Lindley Fol. Orch. Oncidium (1855) p. 45.
Oncidium tigrinum La Llave & Lexarza var. *Montefiorae* Cogniaux Dict. Icon. Orch., Oncidium (1901) t. 4 B.

Judging from the type description of *Odontoglossum Ghiesbreghtianum* supplemented by a photograph and a drawing of a flower (presumably from the type) in the Herbarium of the Muséum d'Histoire Naturelle in Paris, it appears to be certain that this concept is referable to *Oncidium tigrinum*. Moreover, the fact that the lip projects at almost a right angle to the column marks the species as a member of the genus Oncidium rather than of Odontoglossum.

It does not appear to us to be advisable to follow Kränzlin (in Engler Das Pflanzenreich IV. 50, pt. 2 (Heft 80)(1922) 234) in referring *Oncidium splendidum* A. Rich. ex Duchartre to *Oncidium tigrinum*. The almost sessile lip with different calli of the former species seems to be diagnostic, even though the two concepts appear to be closely allied. *Oncidium splendidum* has been reduced to varietal status, as *O. tigrinum* var. *splendidum*, by J. D. Hooker in Bot. Mag. 97 (1871) t. 5878.

Cryptarrhena lunata *R. Brown* in Bot. Reg. 2 (1816) t. 153—Reichenbach filius in Bot. Zeit. 10 (1852) 766—Fawcett & Rendle Fl. Jam. 1 (1910) 135, t. 30, figs. 6, 7.

Clinhymenia pallidiflora A. Richard & Galeotti in Compt. Rend. Acad. Sci. Paris 13 (1844) 512, *nomen*.
Orchidofunckia pallidiflora A. Richard & Galeotti in Ann. Sci. Nat. ser. 3, 3 (1845) 24.
Cryptarrhena Kegelii Reichenbach filius in Bot. Zeit.

10 (1852) 766—Cogniaux in Martius Fl. Bras. 3, pt. 6 (1905) 228, t. 94, fig. 1.

Cryptarrhena pallidiflora Reichenbach filius in Bot. Zeit. 10 (1852) 766.

Cryptarrhena unguiculata Schlechter in Fedde Repert. Beihefte 8 (1921) 103; Beihefte 57 (1929) t. 99, Nr. 389.

To those names which have been found to be synonymous with *Cryptarrhena lunata*, should be added *C. Kegelii*. A series of records of the concept *C. Kegelii* from the Reichenbach Herbarium shows a plant which differs from *C. lunata* only in having entire petals which are narrower than in some forms of that species. Moreover, the description (including measurements) as given by Fawcett and Rendle for the typical Jamaican *C. lunata* corresponds singularly well with that of the South American *C. Kegelii* as portrayed by Cogniaux in Martius Flora Brasiliensis.

Cryptarrhena unguiculata seems to differ from typical *C. lunata* in having slightly larger flowers, but otherwise it appears to coincide well with the aforesaid records of *C. Kegelii*.

Considerable variability occurs in this species in the width of the petals, as well as in the form of the lobes of the lip.

As now understood, *Cryptarrhena lunata* extends from Mexico to Costa Rica. It also occurs in Jamaica and Trinidad, and in British Guiana, Surinam, Colombia, Ecuador and Peru.

Sigmatostalix guatemalensis *Schlechter* in Fedde Repert. 10 (1911) 253.

Sigmatostalix costaricensis Rolfe in Kew Bull. (1916) 78; in Bot. Mag. 145 (1919) t. 8825.

Sigmatostalix poikilostalix Kränzlin in Engler Das

Pflanzenr. IV. 50, pt. 2 (Heft 80) (1922) 310, fig. 27 D, a–e.

On the basis of the plate of *S. costaricensis* (in Bot. Mag. l.c.) and of the description, there appears to be no doubt that it should be referred to the concept *S. guatemalensis*, as described and as represented in the Ames Herbarium by an analytical drawing made under the supervision of Dr. Schlechter. In *S. costaricensis* the leaves are recorded as somewhat broader and the sepals and petals somewhat longer than in *S. guatemalensis*, and the lip is described as minutely apiculate or acute (not obtuse) with the basal callus dentiform and subobtuse (not triangular-linear). A series of Costa Rican specimens referred to *S. costaricensis* have an obtuse lip commonly minutely apiculate and the basal callus varies from dentiform-retuse or dentiform-obtuse to dentiform linear-triangular.

It is also certain that *S. poikilostalix*, which is represented in the Ames Herbarium by a photograph of the type with analytical drawings, must be synonymous with *S. guatemalensis* since its only differences are a slightly narrower lip than in the latter species and a "straight" column.

Schlechter (in Fedde Repert. Beihefte 19 (1923) 68) considered *S. poikilostalix* to be synonymous with *S. costaricensis* and suspected that both were referable to *S. guatemalensis*.

It is unfortunate that the description of *S. guatemalensis* cites no color for the flowers, those of the other two forms being greenish yellow blotched with reddish brown or purple.

Although the species appears to be frequent in Costa Rica and the Chiriqui Province of Panama, it has been but once recorded from Guatemala.

Sigmatostalix unguiculata *C. Schweinfurth sp. nov.*

Herba parva, epiphytica, caespitosa. Pseudobulbi approximati, late patentes, ellipsoidei vel ovoidei, valde complanati, monophylli, vaginis foliiferis nonnullis utrinque suffulti. Folia anguste oblonga vel oblongo-elliptica, apice rotundato oblique bilobulata, in sicco nitida et submembranacea. Inflorescentiae axillares, breves, laxissime rariflorae. Flores parvuli. Sepala petalaque reflexa, membranacea, elliptico-lanceolata vel ovato-lanceolata, acuminata. Labellum perlonge unguiculatum; lamina profunde trilobata cum lobis lateralibus valde arcuato-porrectis, triangulari-linearibus et lobo intermedio pandurato, subacuto. Columna gracillima, arcuata.

Plant small, caespitose, epiphytic. Roots fibrous, flexuous, glabrous. Pseudobulbs ellipsoid or ovoid, apparently strongly complanate, monophyllous, about 1–1.5 cm. long, shining, rugose in the dried specimen, supported on each side by commonly three imbricating leaf-bearing sheaths. Leaves linear-oblong to oblong-elliptic, obliquely bilobulate at the rounded apex, conduplicate at the narrowed base, up to 5.6 cm. long and 8 mm. wide (few perfect blades present), submembranaceous, rather shining above, dull beneath. Inflorescences short, axillary, very remotely few-flowered. Flowers apparently secund, widely spreading. Pedicellate ovary filiform, about 8 mm. long. Flowers small. Sepals and petals reflexed, membranaceous, 3-nerved, with a dorsal keel near the apex. Dorsal sepal elliptic-lanceolate, about 5–5.5 mm. long and 2 mm. wide, acuminate with conduplicate upper margins, concave. Lateral sepals ovate-lanceolate, about 5–5.5 mm. long and 2 mm. wide, slightly oblique, acuminate, apiculate. Petals obliquely ovate-elliptic, about 4.8 mm. long and 2.2 mm. wide, acuminate. Lip long-unguiculate with the lamina abrupt-

ly deflexed; claw elongate, narrowly linear, about 5 mm. long, fleshy, 5-nerved; lamina abruptly 3-lobed, cordate at the base with the lateral lobes abruptly arcuate-spreading then porrectly inflexed, triangular-linear, fleshy-thickened, densely pubescent; the anterior margins of the oblique bases of the lobes pass into a fleshy ovate-triangular bilobed callus which occupies the entire center of the lip; mid-lobe narrowly pandurate, 1-nerved, about 2 mm. long with its dilated base concealed by the central callus, the narrower isthmus dilated into a transversely ovate-rhombic apical portion which is subacute with a dorsal subapical keel. Column slender, arcuate, gradually dilated above, with a prominent stigmatic orifice, about 4.8 mm. long in natural position.

Sigmatostalix unguiculata is apparently unique in the genus by reason of its long, slender claw and its peculiar arcuate-porrect narrow lateral lobes of the lip. In some respects it suggests the Colombian *S. minax* Kränzl.

Costa Rica: epiphyte on fallen branch, vicinity of El General, Province of San José, at 975 meters altitude, flowers greenish, December 1936, *Alexander F. Skutch 3020* (Type in Herb. Ames No. 55414).

EXPLANATION OF THE ILLUSTRATIONS

PLEUROTHALLIS AURITA *C. Schweinf.* 1, plant, natural size. 2, flower, from side, six times natural size. 3, lip, from side, six times natural size. 4, lip, from front, six times natural size. 5, dorsal sepal, petals and column, six times natural size.

PLEUROTHALLIS SACCATILABIA *C. Schweinf.* 6, plant, natural size. 7, flower expanded, from front, six times natural size. 8, lip, from side, seven times natural size. 9, lip expanded, from front, seven times natural size. 10, flower, from side, six times natural size.

Drawn November 1939 by G. W. DILLON

HEXADESMIA FALCATA *C. Schweinf.* 1, plant, one half natural size. 2, flower, from front, with lateral sepals expanded, one and one half times natural size. 3, lateral sepal, from back, one and one half times natural size. 4, dorsal sepal, one and one half times natural size. 5, petal, one and one half times natural size. 6, column and lip, one and one half times natural size. 7, three pollinia, five times natural size. 8, anther, five times natural size.

Drawn June 1939 by G. W. DILLON

EPIDENDRUM CORDIFORME *C. Schweinf.* 1, plant, natural size. 2, flower, from front, twice natural size. 3, petal, twice natural size. 4, lateral sepal, twice natural size.

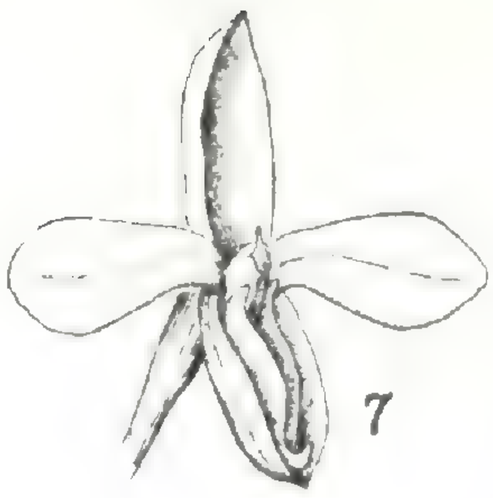
SIGMATOSTALIX UNGUICULATA *C. Schweinf.* 5, plant natural size. 6, flower, from front, three times natural size.

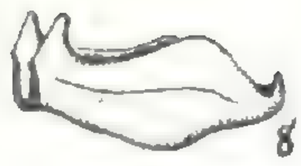
Drawn November 1939 by G. W. DILLON

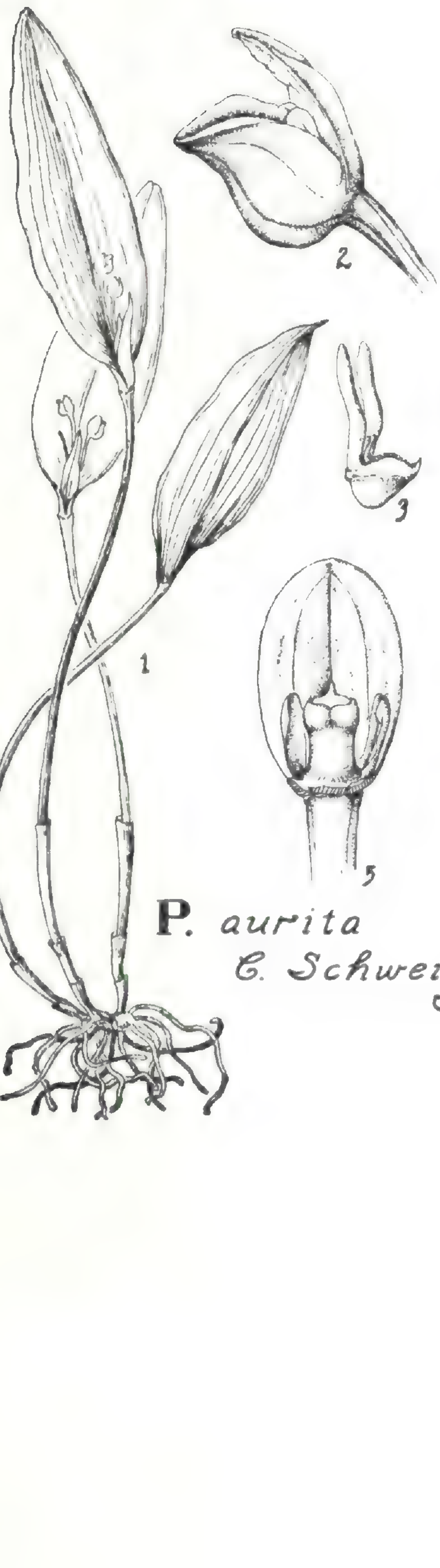
PLEUROTHALLIS

saccatilabia

C. Schweinf.





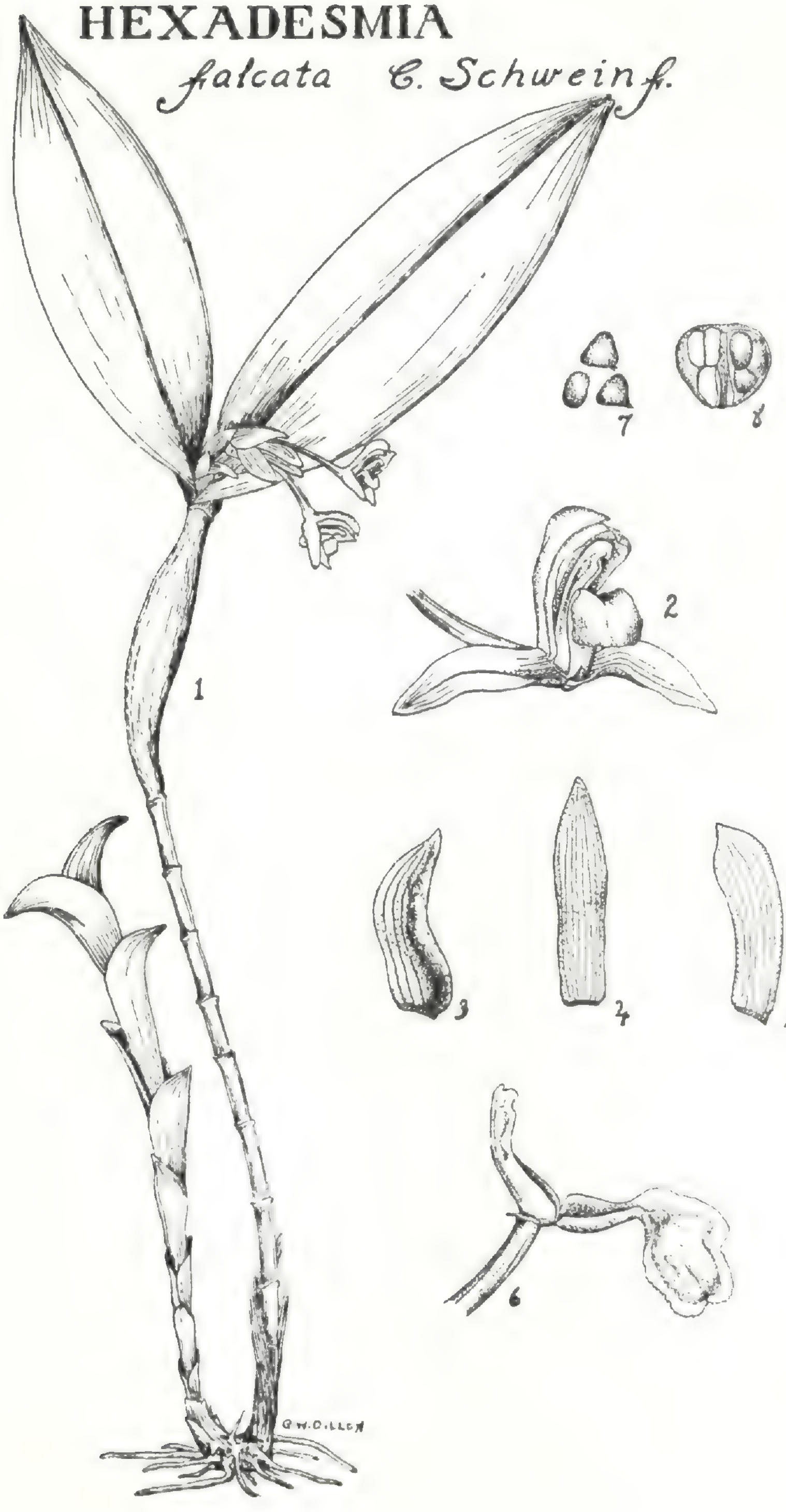


P. aurita

C. Schweinf.

HEXADESMIA

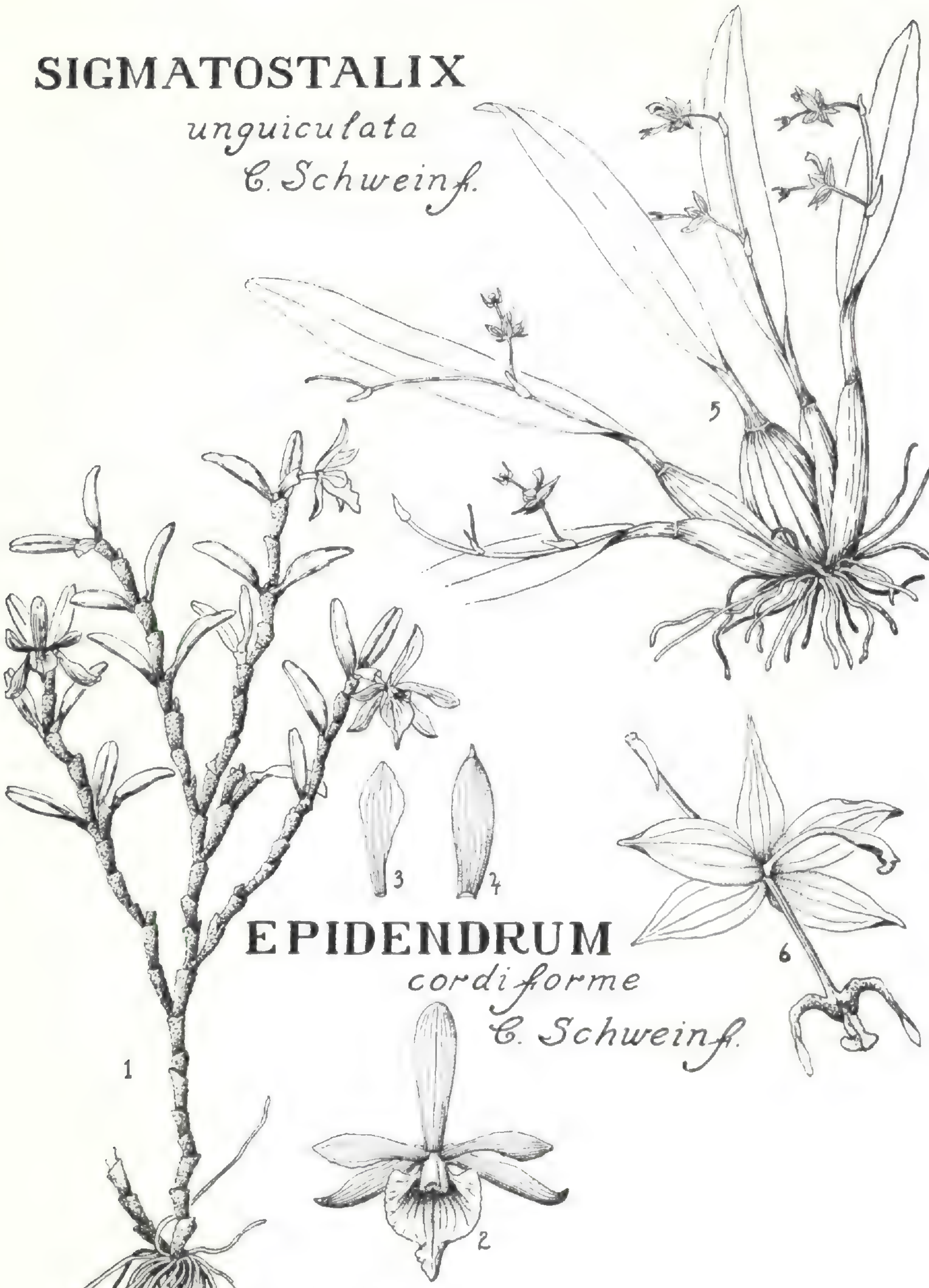
falcata C. Schwein f.



SIGMATOSTALIX

unguiculata

C. Schweinf.



EPIDENDRUM

cordiforme

C. Schweinf.

Gordon W Dillon

SCI QK1 .H28 v.8 no.3

BOTANICAL MUSEUM LEAFLETS
HARVARD UNIVERSITY

CAMBRIDGE, MASSACHUSETTS, MARCH 1, 1940 VOL. 8, NO. 3

NOTE ON THE GERMINATION OF NEPENTHES SEEDS SOWN ON AGAR

BY
JOHN N. PORTER

THE writer was supplied with seeds of a species of *Nepenthes* which had been collected August 8, 1937 by Professor C. T. Brues of Harvard University. The exact place of collection was the slope of Mt. Sapoeton on the northern end of the island of Celebes in the Dutch East Indies. This species was growing at an elevation of approximately 4500 ft. in cindery, undulating, open country, and the plants from which the seeds were obtained had produced pitchers which were between five and six inches in length.

The seeds were sown November 5, 1937 on a sterile agar medium of the formula recommended by Knudson[1] for orchid seeds. Of necessity, all aseptic precautions were taken and the seeds were sterilized for twenty minutes in a solution of calcium hypochlorite in which ten grams of this substance were shaken with 140 c.c. of distilled water. Perhaps the seeds should have been left even long-

[1] *Knudson*, L. Nonsymbiotic germination of orchid seeds. Bot. Gaz. 73: 1–25. 1922.

$Ca(NO_3)_2$	1.00 gm.	$(NH_4)_2SO_4$	0.50 gm.
K_2HPO_4	0.25 "	Sucrose	20.00 "
$MgSO_4.7H_2O$	0.25 "	Agar	15.00 "
$FePO_4$	0.05 "	Dist. water	1,000 c.c.

er in the sterilizing solution because a few of the flasks subsequently became contaminated.

By December 3, 1937 it was noted that these seeds had begun to germinate definitely and two leaves were observed to have been produced by December 13th. Very close to 100% germination had occurred by this time. On January 20, 1938, the flasks were rinsed with distilled water, thus washing the seedlings from the agar and onto cheesecloth, from whence they were picked off and placed on fine peat in pots. At this time (two and one half months) they were about 8 mm. high and medium green in color. No root system was at all visible to the naked eye. These plants were transferred later to very large pots and, at the present time (October 26, 1939), should be transferred once more to suitable baskets or the like. During the past summer the plants grew quite rapidly and the longest leaves now measure 23–25 cm. from base of petiole to leaf tip. Pitchers are of varying lengths, some being 6–7 cm. in length. A drawing (one seventh natural size), showing the plants in October 1939, is appended.

Because the plants are still quite young, only a tentative identification has been made. All indications are that they are *Nepenthes maxima* Reinw. Danser[1], moreover, states that this species is the one most commonly encountered in the part of Celebes from which the plants in question originated, and that previous collections have been made of this species from Mt. Sapoeton.

Although seedlings of *N. maxima* can be raised by the ordinary methods of cultivation and, according to Bailey[2], thrive well, it is doubtful whether the results

[1] *Danser, B. H.* Contributions à l'étude de la flore des Indes néerlandaises 15. Bull. Jard. Bot. Buitenzorg 9: 249-438. 1928.

[2] *Bailey, L. H.* Standard Cyclopedia of Horticulture. 4: 2125, 1916.

NEPENTHES SP.

are as satisfactory as is the case with the agar method. If contamination is kept to the minimum and the seeds are comparatively fresh, almost 100% germination may be achieved on agar. Development up to a point where seedlings may be picked off onto pots is rapid, and the young plants seem quite healthy at this time. It is hoped that this note will be of aid to those wishing to utilize *Nepenthes* seed material in the most efficient manner possible, as would be the case where a large percentage of germination is desired.

Sci 2120.96.5

BOTANICAL MUSEUM LEAFLETS
HARVARD UNIVERSITY

CAMBRIDGE, MASSACHUSETTS, MARCH 19, 1940 VOL. 8, NO. 4

A CONTRIBUTION TO OUR KNOWLEDGE OF THE ORCHIDS OF THE SOUTHEASTERN UNITED STATES

BY

DONOVAN S. CORRELL

THIS paper presents a summary of the results of several years research on the Orchidaceae of the southeastern United States. In 1897, Chapman's Flora of the Southern United States (ed. 3, pp. 477-491) contained sixty-six species and varieties of orchids. Since that time, however, our knowledge of the southern flora has been greatly increased. Consequently, in 1933, Small (Manual of the Southeastern Flora, pp. 363-399), with a rather liberal treatment of the Orchidaceae, included one hundred and fifteen species for this region. In the present conservative treatment of this family, forty-three genera and one hundred and ten species and varieties of orchids are recognized in the southeastern states which include North Carolina, Tennessee, Mississippi, Louisiana and those states south of the North Carolina-Tennessee boundary.

The Table records the species which have been found in each of the southeastern states and is based upon a critical examination of specimens found in forty-nine herbaria in the southern, eastern and central United States. The herbarium material examined was supplemented by five extensive collecting trips which I made in this region. The occurrence and degree of abundance

of a species in each of the states is indicated in the table by the following symbols: R (rare); L (localized); O (occasional); F (frequent); C (common). In some cases where a species has been reported in literature from one of the states under consideration, but no specimen has been observed from this state, the report is designated in the Table by the symbol X.

Although many of the species are apparently limited to one or more of the several geographical regions which are found in the Southeast, others have been found to be universally distributed throughout the entire region. Some of the species which are limited in their distribution are those which are apparently confined to the narrow strip of subtropical vegetation found on the southern tip of the Florida peninsula; namely, the species of *Oncidium*, *Cyrtopodium*, *Basiphyllaea* and others. On the other hand, some few of the species are restricted to the mountains; namely, *Habenaria psycodes* and its variety *grandiflora*, *H. orbiculata*, *H. viridis* var. *bracteata* and *Goodyera repens* var. *ophioides*. This should be taken into consideration in interpreting the symbols in the Table. For instance, a species may be found only in the Mountain and Piedmont regions of North Carolina where it is common, while, at the same time, it may not have been found at all in the Coastal Plain region. In this case, the species would be marked "common" (C) for North Carolina because it is common within its natural limit of distribution. The most abundant and widely distributed species found in the southeastern states are *Calopogon pulchellus*, *Habenaria ciliaris*, *H. cristata*, *Pogonia ophioglossoides*, *Malaxis unifolia*, *Tipularia discolor* and several species of *Spiranthes*.

Some exceptional range extensions were discovered during this research; notably, *Spiranthes Romanzoffiana* from South Carolina, *Listera convallarioides* from the

mountains of North Carolina and *Arethusa bulbosa* from Louisiana. *Spiranthes Romanzoffiana* is represented (in the Gray Herbarium) by a single plant mounted on a sheet with a plant of *S. cernua* var. *odorata*. The name on the label, in M. A. Curtis' handwriting, is *Spiranthes cernua*. The occurrence of this species in South Carolina is most unusual, if not doubtful, since the nearest station is in New York. Two collections of *Listera convallarioides* were seen from the southeastern states. These were a specimen from "Mts. Carol." in the Gray Herbarium which was collected by Asa Gray and a specimen in the herbarium of the New York Botanical Garden labeled "Southern Flora" by A. W. Chapman. The occurrence of this widely ranging Canadian and Northwestern species in the mountains in North Carolina is very interesting. *Arethusa bulbosa* is represented from Louisiana by a solitary specimen in the herbarium of the Missouri Botanical Garden mounted on a sheet with plants of *Pogonia ophioglossoides* which were collected by Josiah Hale at Alexandria, Rapides Parish, Louisiana.

In studying the Orchidaceae of the southeastern United States, I have arrived at certain conclusions concerning the status of some of the so-called species in the genera *Calopogon* and *Spiranthes*. In a conservative treatment of these two genera, it is necessary to recognize some of the material under the following new combinations.

Calopogon barbatus *(Walt.) Ames* var. **multiflorus** *(Lindl.) Correll comb. nov.*

Calopogon multiflorus Lindley Gen. & Sp. Orch. Pl. (1840) 425.

TYPE LOCALITY: "Hab. in Florida, *F. Cozzens.*"

Limodorum multiflorum Mohr in Bull. Torr. Bot. Club 24 (1897) 23.

Limodorum pinetorum Small in Bull. N. Y. Bot. Gard. 3 (1905) 421.

Basis for my conception of the variety: An examination of Nos. 4305 and 6840 in Herb. Ames which were compared by Ames with the type of *Calopogon multiflorus* at Kew; also an examination of the type of *Limodorum pinetorum (Small 1676)* in Herb. N. Y. Bot. Gard. and an examination of No. 19313 (Co-type of *L. pinetorum*) in Herb. Ames which was compared by Ames with Lindley's type of *Calopogon multiflorus* at Kew.

Description: Rootstalk a horizontal elongate (rarely bulbous) corm which is often 4 cm. long and 5 mm. in diameter, having a tuft of roots at the proximal end and the remains of the old stalk at the distal end. Plant scapose, erect, rigid, glabrous, 1.5–4.5 dm. tall, often with several scarious sheaths at the base; stem green below, chocolate-colored or dark madder-purple above, usually geniculate at the base (two stems occasionally produced from the same corm). Leaves (when present) one or two, narrowly linear, long-acuminate, basal, the lower portion sheathing the stem, firm and rigid, conspicuously nerved, conduplicate, 4–19 cm. long, mostly less than 5 mm. wide. Inflorescence a dense or loose elongate raceme composed of six to ten or more showy flowers which open in rapid succession, 3.5–15 cm. long, 3–3.5 cm. in diameter. Floral bracts ovate-lanceolate to lanceolate, long-acuminate, 5–10 mm. long. Flowers vividly magenta-purple to deep crimson, on slender pedicellate ovaries which are 6–10 mm. long. Lateral sepals rising from a wide base, ovate-oval to broadly lanceolate, falcate, abruptly acute or acuminate (often long-acuminate), sometimes keeled at the apex, 11–13 mm. long, 5–7 mm. wide. Dorsal sepal narrowly oblong, somewhat concave, acute or apiculate, 13–14.5 mm. long, 4–6 mm. wide. Petals with a rather

prominent claw, broadly oblong-elliptic, pandurate or obovate (rarely cuneate) and rounded, obtuse or acute, widest above the middle, with the upper margin often irregularly crenulate, 10–13 (averaging 11) mm. long, 4–6 mm. wide above the middle. Lip obscurely 3-lobed, 8–9.5 mm. long; lateral lobes more distinct than in the species, basal, broadly rounded, separated from the mid-lobe by a short isthmus which has parallel sides; mid-lobe triangular-deltoid, with a wide slightly rounded-truncate or retuse apex (occasionally apiculate), with essentially straight (not rounded) lateral margins, 8–10 mm. wide; disc bearded on the central portion with clavellate (often bifurcate) hairs, the long hairs near the base bright yellow, the shorter central hairs orange and the anterior hairs (not reaching the apical margin) gradually reduced to purple papillae. Column 5.5–7 mm. long, broadly winged on each side near the apex, 4.5–6 mm. wide across the wings; the pair of wings when spread out semiorbicular, subtruncate at the base.

COMMENTS: *Calopogon barbatus* and *C. barbatus* var. *multiflorus* intergrade in all of their floral segments. However, var. *multiflorus*, besides having more flowers in the raceme than does the species, also has petals which are constantly widest above the middle, whereas those of the species are constantly widest below the middle.

HABITAT: Acid soils; most commonly found in recently burnt-over damp sandy pinelands; also found in flatwoods, pine-barrens, among saw palmettos, on the edge of hammocks and in swampy fields or grassy savannahs.

FLOWERING SEASON: Early March (rarely February) to July.

ILLUSTRATION: Ames Contribution to Our Knowledge of the Orchid Flora of Southern Florida (1904) pl. 10 (as *C. multiflorus*).

GEOGRAPHICAL DISTRIBUTION:

Georgia: Camden and Charlton Counties.

Florida: Alachua, Brevard, Broward, Collier, Dade, Duval, Franklin, Highlands, Hillsborough, Lee, Levy, Manatee, Martin, Monroe, Nassau, Orange, Pasco, Pinellas, Polk, Saint Johns, Seminole and Volusia Counties.

Alabama: Mobile County.

Mississippi: Jackson County.

Spiranthes gracilis *(Bigel.) Beck* var. **brevilabris** *(Lindl.) Correll comb. nov.*

Spiranthes brevilabris Lindley Gen. & Sp. Orch. Pl. (1840) 471.

TYPE LOCALITY: "Hab. in Texas, *Drummond*, *Andrieux*."

BASIS FOR MY CONCEPTION OF THE VARIETY: An examination of No. 2304 in Herb. Ames which was compared by Ames with Lindley's type of *S. brevilabris* at Kew.

DESCRIPTION: Similar to the species except for the densely pubescent spike. Rachis with whitish pubescence; ovaries more or less covered with a dense mat of reddish brown hairs (rarely sparsely pubescent); perianth parts somewhat pubescent on the outer surface. Plant 1–3.5 dm. tall. Leaves similar to those of the species, mostly persistent. Spike 2 15 cm. long. Floral bracts usually much longer than in the species, 5 -14 mm. long, awn-like at the apex. Flowers apparently white or cream-colored (no fresh material was seen). Petals usually irregularly eroded near the apex. Lip with longer and more finely lacerate fringes than in the species (often fringed along the margin to the base), strongly arcuate-decurved, often conspicuously constricted at the middle, with a

dense tuft of hairs on the disc near the apex; basal callosities thick, stout, prominent.

COMMENTS: In 1840, Lindley (Gen. & Sp. Orch. Pl. pp. 471-472), in describing *S. brevilabris*, wrote: "Labello brevi oblongo utrinque rotundato apice crispo medio pubescente. . . . . This seems distinct from *S. gracilis*, to which it is the most nearly allied, in its spikes being very dense and covered with coarse short hairs; the lip too has quite a different form. Flowers are stated by Andrieux to be purple."

Later, 1905, Ames (Orch. 1, p. 123) wrote: "*S. brevilabris*, Lindl., seems to be a pubescent form of *S. gracilis*, Beck." I have examined material from the southeastern states and Texas which is at once distinct from typical *S. gracilis*. The Texas material (cited below) is so robust and densely pubescent that, if it were aphyllous or if the leaves were linear instead of being ovate-oblong, it could immediately be referred to *S. vernalis*. Besides having a densely pubescent spike, var. *brevilabris* is characterized by the lip having very deeply and finely lacerate-fringed margins and a dense tuft of hairs on the disc near the apex. I am unable to state the color of the flowers. It is highly improbable that they are purple as Andrieux stated.

HABITAT: In dry prairies and pine-barrens or open sandy soil and wet pinelands.

FLOWERING SEASON: February to May.

GEOGRAPHICAL DISTRIBUTION (Specimens examined):

Georgia: Thomas County: Thomasville, April 1, 1903, *E. B. Taylor* (Herb. Ames); Thomasville, late March 1903, *Mrs. A. P. Taylor* (Herb. Ames). Also Wrightsboro (spike pubescent!), *A. W. Chapman* [?] (Herb. N.Y. Bot. Gard.).

Florida: Hillsborough County: Tampa Bay, 1834,

Dr. Burrows (Herb. N.Y. Bot. Gard.). Lee County: Vicinity of Fort Meyers, February 28, 1916, *P. C. Standley 12820* (U.S. Nat. Herb.); Vicinity of Fort Myers, November 11, 1916, *Jeanette P. Standley 409* (U.S. Nat. Herb.); Vicinity of Fort Myers, December 17, 1919, *P. C. Standley 18939* (U.S. Nat. Herb.); about 6.5 miles northwest of Fort Myers, February 8, 1938, *C.C. Deam 58768* (Herb. Duke Univ.). Polk County: near Bartow, April 3, 1931, *E. J. Palmer 38376* (Herb. Ames and U.S. Nat. Herb.). Also Fort Lauderdale to Miami, February 1911, *J.K. & G.K. Small & J. J. Carter 3319* (Herb. Ames and Herb. N.Y. Bot. Gard.); Fort Shackleford, Big Cypress, March 7, 1919, *P. P. Sheehan* (Herb. N.Y. Bot. Gard.).

Louisiana: Orleans Parish: New Orleans, *Drummond 405* (Gray Herb.). Also "Louisiana, April", *J. Hale* (Herb. N.Y. Bot. Gard.).

Texas: Galveston County: Galveston, May 1843, *F. Lindheimer* [labeled *S. breviabris* by Asa Gray] (Gray Herb.); Kemah, alt. 30 ft., April 21, 1924, *G. L. Fisher 376* (U.S. Nat. Herb.). Harris County: Houston, March 1840, *F. Lindheimer* (Gray Herb.); Houston, April 1, 1872, *E. Hall 626* (Gray Herb., Brown Univ. Herb. & U.S. Nat. Herb.); Houston, alt. 50 ft., April 13, 1924, *G. L. Fisher 377* (U.S. Nat. Herb.).

Spiranthes gracilis *(Bigel.) Beck* var. **floridana** *(Wherry) Correll comb. nov.*

Ibidium floridanum Wherry in Journ. Wash. Acad. Sci. 21 (1931) 49.

TYPE LOCALITY: Florida, Duval County, near Loretto, April 14, 1930, *Edgar T. Wherry.*

Spiranthes floridana Cory in Rhodora 38 (1936) 405.

Basis for my conception of the variety: An examination of the type of *Ibidium floridanum* in U. S. Nat. Herb.; also examination of other material collected and distributed by Wherry under the name of *I. floridanum*.

Description: Similar to the species except for the lip having a yellow (instead of green) center and having persistent leaves which are much narrower and elongate. The variety also differs markedly from the species in that the spike is secund (rarely spiral).

Plant glabrous (occasionally sparsely pubescent above), 1.4–5.5 dm. tall; stem and leaves light green or yellowish green. Lateral sepals narrowly lanceolate, acuminate, projecting horizontally and conspicuously beyond the arcuate-decurved lip. Petals often irregularly eroded near the apex. Lip ovate to ovate-oblong, truncate or rarely retuse; median portion of the disc yellow (rarely with an obsolete tuft of hairs on the disc near the apex); basal callosities stout or slender.

Comments: In 1931, Wherry (in Journ. Wash. Acad. Sci. 21, p. 49) segregated *Ibidium floridanum* from *I. gracile* (Bigel.) House, stating: ". . . search for morphological differences between them has not been particularly successful. They are, however, more or less distinct in flower color, sepal length, habitat, range, and blooming period, and show no evident intergradation." Furthermore, he said that the ranges of the two species barely overlap. He limited the range of distribution southward for *I. gracile* to South Carolina and east-central Alabama.

On April 6, 1938, I collected a number of specimens of *Spiranthes gracilis* near Gainesville, Alachua County, Florida. The lip of the flowers on all of these plants had the characteristic vividly green markings of *S. gracilis*. During the same week a number of collections of var.

floridana were made in several other counties in northern Florida and southern Georgia. Although Wherry limited the range of *S. gracilis* from east-central Alabama and South Carolina northward, I have examined many specimens of the species from Florida, Louisiana and Texas.

In examining the "noteworthy specimens" of *I. floridanum* cited by Wherry, I found that the Texas, Louisiana and two of the Florida citations are clearly referable to *S. gracilis* var. *brevilabris*. The spike in each of these plants is densely pubescent. It so happens that these two varieties (var. *brevilabris* and var. *floridana*) have the same flowering season. Thus it would be convenient to group them as a single variety under *S. gracilis* if flowering season could be used as a basis for separating species and varieties. In such a case, the plants would stand as *S. gracilis* var. *brevilabris*, the oldest name. However, after having examined material of *I. floridanum*, I regard the essentially glabrous plants upon which Wherry based his description to be taxonomically distinct from var. *brevilabris* and also varietally different from *S. gracilis*.

HABITAT: In wet sandy open pine-barrens and flatwoods, mucky or boggy soil in low pinelands, in savannahs, palmetto-scrub pineland or oak woods and on the edge of swamps and pocosins.

FLOWERING SEASON: January (rarely November and December in Florida) to May.

ILLUSTRATION: Wherry in Journ. Wash. Acad. Sci. 21 (1931) 50, fig. 1 (as *Ibidium floridanum*).

GEOGRAPHICAL DISTRIBUTION:

North Carolina: Pender County.

South Carolina: Charleston, Florence and Sumter Counties.

Georgia: Camden and Charlton Counties.

Florida: Bradford, Brevard, Dade, Duval, Flagler, Hillsborough, Lake, Lee, Nassau, Osceola, Pinellas, Polk, Putnam, Saint Johns, Santa Rosa, Sarasota, Volusia and Washington Counties.

Alabama: Mobile County.

Spiranthes cernua *(L.) L.C.Rich.* var. **odorata** *(Nutt.) Correll comb. nov.*

Neottia odorata Nuttall in Journ. Acad. Nat. Sci. Phila. 7 (1834) 98.

TYPE LOCALITY: ". . . along the borders of the Neuse River, at Newbern, in North Carolina, on the wet and muddy shores. . ."

Spiranthes odorata Lindley Gen. & Sp. Orch. Pl. (1840) 467.

Gyrostachys odorata O. Kuntze Rev. Gen. Pl. 2(1891) 664.

Ibidium odoratum House in Muhlenbergia 1 (1906) 128.

BASIS FOR MY CONCEPTION OF THE VARIETY: An examination of the type of *Neottia odorata* (according to Small, *H. Loomis*, cf. Journ. N.Y. Bot. Gard. 34 (1933) 106) in Herb. N. Y. Bot. Gard. (a flower of the type is figured by Correll in Journ. Elisha Mitchell Sci. Soc. 53 (1937) pl. 15, fig. 8); also an examination of McCarthy's collection from the type locality in Herb. Phila. Acad. Nat. Sci.

DESCRIPTION: Similar in habit to the species, stoloniferous. Roots long, fleshy, coarse. Plant erect, stout or slender, often very succulent, glabrous below, downy-pubescent above, 1.8–9.5 dm. tall. Leaves mostly basal, often extending up the stem, linear to lanceolate, 5–40 cm. long, 5–20 mm. wide. Inflorescence a densely flowered compact spike of tubular ringent flowers in several

spiral or vertical ranks, 4.5–18 cm. long, 1–3 cm. in diameter. Floral bracts lanceolate, acuminate-attenuate, mostly longer than the flowers, 8–15 mm. long. Flowers white, marked with green or cream-tinged, very fragrant of vanilla. Sepals oblong-lanceolate to lanceolate, acute to acuminate, 6–13.5 mm. long; lateral sepals free. Petals coherent with the dorsal sepal, linear, obtuse to acute, 6–13.5 mm. long, 1–2 mm. wide. Lip with the basal half dilated, rhomboidal, tapering to the obtuse apex, broadly ovate to broadly triangular, 6–14 mm. long, 3.5–8 mm. wide near the base; basal callosities prominent, recurved. Column about 5 mm. long.

COMMENTS: I have been unable to find enough constant differences in *Spiranthes cernua* and *S. odorata* to retain them as separate entities. *Spiranthes odorata* seems to be a luxuriant variant of *S. cernua*. The characters found in literature, such as leaves radical (*S. cernua*) and leaves extending up the stem (*S. odorata*), intergrade and break down. Even the lip difference, which may be considered as the most reliable character to separate them, is not always sufficiently distinct to be dependable. Ames (Orch. 1 (1905) 125) in his key grouped the two plants together as "Lip ovate-oblong" and then separated them on leaf differences. In 1834, Nuttall (in Journ. Acad. Nat. Sci. Phila. 7, p. 98) said of *Neottia odorata*: "... labello ovato integro, margine undulato subfimbriato." Linnaeus (Species Plantarum 2 (1753) 946) said that the lip of *Orchis cernua* (*Spiranthes cernua*) was oblong. An examination of a photograph of his type would seem to illustrate this. No. 2230 in Herb. Ames which was compared by Ames with the Linnean type has two plants having flowers with strongly ovate lips. These plants are not in complete agreement with Linnaeus' description. They do, however, agree in lip character with Nuttall's descrip-

tion. In 1921, Ames (in Rhodora 23, p. 74) considered *S. cernua* and *S. odorata* to be the same. He wrote: "*Spiranthes cernua* is so variable that attempts are sometimes made to discover in it a polymorphic species susceptible of splitting. . . It would seem that *S. odorata* owes its success in escaping synonymy to the fact that it was born under authority and subsequently sustained because efforts to recognize it have persisted. I am convinced that *S. odorata* is conspecific with *S. cernua*." Ames' illustration of the lip of *S. cernua* (in Rhodora 23 (1921) pl. 127, fig. 6) is what I consider to be typical of the species. Correll's illustration of the lip of *S. odorata* (in Journ. Elisha Mitchell Sci. Soc. 53 (1937) pl. 15, fig. 8) is typical of *S. cernua* var. *odorata*. Ames (Orch. 1 (1905) 123) considered *Gyrostachys triloba* and *G. constricta* of Small as synonymous with *S. odorata*. I have examined Small's types and consider them to be the same as *S. cernua*.

HABITAT: In marshes, swamps, hammocks, low woods, wet pinelands and borders of rivers and lakes, occasionally in water or on rotten stumps and wood, often in dense clumps because of its stoloniferous habit; in the mountains up to 5000 feet where it is found in dry sandy soils on open hillsides and wooded ridges.

FLOWERING SEASON: September to January; rarely May and July in Florida.

ILLUSTRATION: Correll in Journ. Elisha Mitchell Sci. Soc. 53 (1937) pl. 15, fig. 8—Morris and Eames Our Wild Orchids (1929) pls. 92 and 93—Small in Journ. N. Y. Bot. Gard. 34 (1933) 107, fig. 1; 35 (1934) 18, fig. 1.

GEOGRAPHICAL DISTRIBUTION: I have seen specimens referable to the variety from scattered stations throughout the area of distribution of the species.

North Carolina: Brunswick, Chowan, Columbus,

Craven, Currituck, Halifax, Haywood, New Hanover and Scotland Counties.

South Carolina: Darlington County.

Georgia: Thomas County.

Florida: Alachua, Brevard, Broward, Clay, Dade, Lee, Levy, Marion, Orange, Saint Lucie and Sumter Counties.

Tennessee: Blount and Cocke Counties.

Louisiana: East Baton Rouge, Orleans, Plaquemines, St. Tammany, Terrebonne, West Baton Rouge and West Feliciana Parishes.

A complete synonymy of the majority of the species listed in the Table may be found in Ames Enumeration of the Orchids of the United States and Canada (1924). I have followed, for the most part, the nomenclature found therein. However, some further revisions other than those made above and those found in Ames Enumeration were thought necessary and are as follows:

Calopogon pulchellus *(Salisb.) R. Brown* var. Simpsonii *(Small) Ames* = **Calopogon pulchellus** *(Salisb.) R. Brown*. The mid-lobe of the lip of this species is highly variable and the leaves also vary in shape from almost terete to broadly lanceolate.

Cypripedium parviflorum *Salisbury* and C. pubescens *Willdenow* = **Cypripedium Calceolus** *Linnaeus* var. **pubescens** *(Willd.) Correll.* A comprehensive treatment of this variety may be found in Bot. Mus. Leafl. Harv. Univ. 7 (1938) 1–18.

×Habenaria Canbyi *Ames* = ×**Habenaria Chapmanii** *(Small) Ames (Habenaria ciliaris* × *H. cristata* and *H. blephariglottis* × *H. cristata)*. I have seen specimens of typical × *H. Canbyi* from Hardin County, Texas.

W. M. Canby, who first collected the hybrid near Lewes, Delaware, recorded the following notes: "*Habenaria cristata*×*blephariglottis*? Intermediate in color, size of flowers, openness of panicle, etc. between the two species. . . . in company with *H. cristata* and *H. blephariglottis*, July 27, 1878." Ames (in Rhodora 10 (1908) 70) recognized the plant as a hybrid and named it for the collector. Earlier, in 1903, Small (Flora Southeastern U.S. (1903) 314) described ×*H. Chapmanii* as a hybrid of *H. cristata* × *H. ciliaris*. So far as I can determine, *H. blephariglottis* has not been reported or collected in the south further west than Mississippi; whereas, *H. ciliaris* occurs in eastern Texas. Although *H. cristata* has not been reported from Texas, I believe it should occur there since I have collected the species throughout Louisiana, including several parishes adjacent to Texas. The occurrence of ×*H. Canbyi* in Texas and the apparent lack of *H. blephariglottis* in Louisiana and Texas arouses suspicion as to which species are the true parents of the hybrid. Since Small's type of ×*H. Chapmanii* is undoubtedly a hybrid of *H. cristata*×*H. ciliaris* or *H. blephariglottis* and since it is impossible, without experimental evidence, to determine the true identity of the parent species of either of the described hybrids, we should accept the older and valid name and consider all of the so-called hybrids exhibiting intermediate characters between the above species as ×*H. Chapmanii*.

HABENARIA MACROCERATITIS *Willdenow* = **Habenaria quinqueseta** *(Michx.) Swartz.* These two concepts have been separated primarily on the length of the spur; the spur of *H. quinqueseta* being less than 10 cm. long, whereas the spur of *H. macroceratitis* is more than 10 cm. long. I have compared Florida material referred to these two concepts with material from the West Indies,

Central and South America and have found a graduated series in the length of the spur from 4 to 18 cm.

PONTHIEVA BRITTONAE *Ames* = **Ponthieva racemosa** *(Walt.) Mohr.* Ames (in Torreya 10 (1910) 90), in describing *P. Brittonae*, wrote: "*Ponthieva Brittonae* is very closely allied to *P. racemosa* from which it differs chiefly in its smaller flowers, slenderer raceme, and in its differently formed petals." I have examined numerous sheets of *P. racemosa* as well as a sheet compared by Ames with the type of this species and also all available material of so-called *P. Brittonae* (including the type) and have been unable to find sufficient differences to separate them. A complete series of differences in size was found in the plants examined. The petals were also found to be variable.

×**Spiranthes laciniata** *(Small) Ames.* I have examined the type of *Gyrostachys laciniata* Small and a number of other sheets of *Spiranthes laciniata* in the New York Botanical Garden Herbarium which were referred to *S. laciniata* by Small, and, after having compared this material with authentic specimens of *S. praecox* and *S. vernalis*, I have concluded that *S. laciniata* should be considered as a hybrid of these two concepts. The hybrid plants are rather coarse, having intermediate characters of *S. praecox* and *S. vernalis*. Some of the forms often approach very closely one or the other of the parent species.

I have examined the North Carolina specimen cited as *Malaxis Bayardi* Fernald (in Rhodora 38 (1936) 403) and consider it to be *M. unifolia* Michx.

I wish to express my gratitude to Dr. H. L. Blomquist, Professor Oakes Ames and Mr. Charles Schweinfurth for their encouragement and constructive criticism during this research. I also wish to express my sincere

thanks to the various individuals and herbaria for their generous assistance and coöperation in the course of this work. I am indebted to my wife, Dr. Helen B. Correll, for her assistance in the final preparation of the manuscript. I wish to acknowledge the Research Grant of 1936 by the American Association for the Advancement of Science which was awarded me through the North Carolina Academy of Science.

TABLE

Distribution of the species by states and degree of abundance:
R (rare); L (localized); O (occasional); F (frequent); C (common);
X (reported in literature)

	Ala.	Fla.	Ga.	La.	Miss.	N.C.	S.C.	Tenn.
Aplectrum hyemale *(Muhl.) Torr.*	X		LR			O	X	O
Arethusa bulbosa *L.*				LR		R		
Basiphyllaea corallicola *(Small) Ames*		LR						
Bletia tuberosa *(L.) Ames*		LC						
Brassia caudata *(L.) Lindl.*		LR						
Calopogon barbatus *(Walt.) Ames*	R	C	F	R	R	O	LO	
Calopogon barbatus *(Walt.) Ames* var. multiflorus *(Lindl.) Correll*	LR	C	LR		LR			
Calopogon pallidus *Chapm.*	O	C	F	LR	LO	F	F	
Calopogon pulchellus *(Salisb.) R. Br.*	F	C	C	O	O	C	F	F
Campylocentrum pachyrrhizum *(Reichb.f.) Rolfe*		LR						
Centrogenium setaceum *(Lindl.) Schltr.*		LR						
Cleistes divaricata *(L.) Ames*	R	F	O	R	LR	F	F	R
Corallorrhiza maculata *Raf.*						O		X
Corallorrhiza odontorhiza *(Willd.) Nutt.*	O		O		R	C	LO	O
Corallorrhiza trifida *Chatelain*						X		X
Corallorrhiza Wisteriana *Conrad*	LR	F	O	O	R	R	O	F
Cranichis muscosa *Sw.*		LR						
Cypripedium acaule *Ait.*	R		R			F	R	F

	Ala.	Fla.	Ga.	La.	Miss.	N.C.	S.C.	Tenn.
Cypripedium Calceolus *L.* var. pubescens *(Willd.) Correll*	O		F	R	R	F	R	C
Cypripedium reginae *Walt.*						R		X
Cyrtopodium punctatum *(L.) Lindl.*		LF						
Epidendrum anceps *Jacq.*		LF						
Epidendrum Boothianum *Lindl.*		LR						
Epidendrum cochleatum *L.* var. triandrum *Ames*		LC						
Epidendrum conopseum *R.Br.*	LR	C	F	LF		LR	LO	
Epidendrum difforme *Jacq.*		LF						
Epidendrum nocturnum *Jacq.*		LC						
Epidendrum pygmaeum *Hook.*		LR						
Epidendrum rigidum *Jacq.*		LC						
Epidendrum strobiliferum *Reichb.f.*		LR						
Epidendrum tampense *Lindl.*		C						
Erythrodes querceticola *(Lindl.) Ames*		C		O				
Eulophia alta *(L.) Fawc. & Rendle*		LF						
Eulophia ecristata *(Fern.) Ames*		C		R		LR		
Goodyera pubescens *(Willd.) R.Br.*	LR	X	LO			C	LO	C
Goodyera repens *(L.) R.Br.* var. ophioides *Fern.*		X				O		O
×Habenaria Andrewsii *White ex Niles*						R		
Habenaria blephariglottis *(Willd.) Hook.*	O	C	F		LC	F	R	X

	Ala.	Fla.	Ga.	La.	Miss.	N.C.	S.C.	Tenn.
Habenaria blephariglottis (*Willd.*) *Hook.* var. holopetala *(Lindl.) A.Gray*	O				R	R		O
×Habenaria Chapmanii *(Small) Ames*		O	O			R		
Habenaria ciliaris *(L.) R.Br.*	F	C	C	F	O	C	F	C
Habenaria clavellata *(Michx.) Spreng.*	O	R	F	F	O	C	O	O
Habenaria cristata *(Michx.) R.Br.*	O	F	F	C	O	C	F	R
Habenaria distans *Griseb.*		LR						
Habenaria flava *(L.) R.Br. ex Spreng.*	R	O	F	R	R	R	R	R
Habenaria integra *(Nutt.) Spreng.*	O	O	O	R	LF	O	R	R
Habenaria lacera *(Michx.) Lodd.*	R		R		R	O	R	R
Habenaria leucophaea *(Nutt.) A.Gray*				R				
Habenaria nivea *(Nutt.) Spreng.*	O	C	F	O	LO	R	R	
Habenaria orbiculata *(Pursh) Torr.*			?			R		X
Habenaria peramoena *A.Gray*	R		?		R	O	LR	R
Habenaria psycodes *(L.) Spreng.*			R			O		O
Habenaria psycodes (*L.*) *Spreng.* var. grandiflora *(Bigel.) A.Gray*						R		X
Habenaria quinqueseta *(Michx.) Sw.*	R	C	X	R	X		R	X
Habenaria repens *Nutt.*	R	C	O	F		LR	O	

	Ala.	Fla.	Ga.	La.	Miss.	N.C.	S.C.	Tenn.
Habenaria strictissima *Reichb.f.* var. odontopetala *(Reichb.f.) L.O.Williams*		C						
Habenaria viridis *(L.) R.Br.* var. bracteata *(Muhl.) A.Gray*						R	X	X
Harrisella porrecta *(Reichb.f.) Fawc. & Rendle*		O						
Hexalectris spicata *(Walt.) Barnhart*	O	F	F	O	O	O	O	F
Ionopsis utricularioides *(Sw.) Lindl.*		LR						
Isotria affinis *(Austin) Rydb.*						R		
Isotria verticillata *(Muhl.) Raf.*	O	R	R	R	O	F	R	O
Lepanthopsis melanantha *(Reichb.f.) Ames*		LR						
Liparis elata *Lindl.*		LR						
Liparis liliifolia *(L.) L.C.Rich. ex Lindl.*	LR	X	LR			F	O	O
Liparis Loeselii *(L.) L.C.Rich.*	LR					R		X
Listera australis *Lindl.*	X	O		F	R	LR	O	X
Listera convallarioides *(Sw.) Nutt.*						LR		X
Listera cordata *(L.) R.Br.*						R		
Listera reniformis *Small*						F		R
Macradenia lutescens *R.Br.*		LR						
Malaxis monophyllos *(L.) Sw.* var. brachypoda *(A.Gray) Morris & Eames*								X
Malaxis spicata *Sw.*		C	LR				LR	
Malaxis unifolia *Michx.*	F	LR	C	F	X	C	O	O
Maxillaria crassifolia *(Lindl.) Reichb.f.*		LR						

	Ala.	Fla.	Ga.	La.	Miss.	N.C.	S.C.	Tenn.
Oncidium carthaginense *(Jacq.) Sw.*		LR						
Oncidium floridanum *Ames*		LF						
Oncidium luridum *Lindl.*		LF						
Oncidium variegatum *Sw.*		LR						
Orchis spectabilis *L.*	R		R			O	R	F
Pleurothallis gelida *Lindl.*		LR						
Pogonia ophioglossoides *(L.) Ker-Gawl.*	O	C	F	O	O	F	F	R
Polyrrhiza Lindenii *(Lindl.) Cogn.*		LR						
Polystachya luteola *(Sw.) Hook.*		LC						
Ponthieva racemosa *(Walt.) Mohr*	O	C	R	LR		LR	O	
Prescottia oligantha *(Sw.) Lindl.*		LR						
Spiranthes Beckii *Lindl.*	F	C	C	F	O	C	O	F
Spiranthes cernua *(L.) L.C.Rich.*	O	O	F	O	R	C	F	F
Spiranthes cernua *(L.) L.C. Rich.* var. odorata *(Nutt.) Correll*	X	C	R	O		O	R	R
Spiranthes cranichoides *(Griseb.) Cogn.*		F						
Spiranthes elata *(Sw.) L.C.Rich.*		LR						
Spiranthes gracilis *(Bigel.) Beck*	F	O	F	R	R	C	O	F
Spiranthes gracilis var. brevilabris *(Lindl.) Correll*		R	R	R				
Spiranthes gracilis var. floridana *(Wherry) Correll*	R	C	R			R	R	

	Ala.	Fla.	Ga.	La.	Miss.	N.C.	S.C.	Tenn.
×Spiranthes laciniata *(Small) Ames*	R	O	O	R		LR	LR	
Spiranthes longilabris *Lindl.*	R	F	R	O	LR	LR	R	
Spiranthes lucida *(H.H.Eaton) Ames*						X		X
Spiranthes ovalis *Lindl.*	R	R	R	O	R	LR		X
Spiranthes polyantha *Reichb.f.*		LR						
Spiranthes praecox *(Walt.) S.Wats.*	O	C	F	O	LR	C	F	
Spiranthes Romanzoffiana *Cham.*							?	
Spiranthes tortilis *(Sw.) L.C.Rich.*		LO		LR				
Spiranthes vernalis *Engelm. & Gray*	R	C	F	O	R	C	O	R
Stenorrhynchus orchioides *(Sw.) L.C.Rich.*		O						
Tipularia discolor *(Pursh) Nutt.*	O	LO	F	C	X	C	F	F
Triphora cubensis *(Reichb.f.) Ames*		LR						
Triphora trianthophora *(Sw.) Rydb.*	R	O	R		R	F	R	F
Tropidia polystachya *(Sw.) Ames*		LO						
Vanilla articulata *Northrop*		LR						
Vanilla Eggersii *Rolfe*		LO						
Vanilla fragrans *(Salisb.) Ames*		LR						
Vanilla phaeantha *Reichb.f.*		LR						
Zeuxine strateumatica *(L.) Schltr.*		O						

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SOME NOMENCLATORIAL PROBLEMS IN ACACIA

BY

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DURING THE course of investigations dealing with gums and gum-bearing plants it has become increasingly evident that several of the species involved bear scientific names which cannot be maintained under the International Rules of Nomenclature. It seems desirable in the present paper to summarize the nomenclatorial history of these species and to indicate their correct names. A more complete synonymy of these, and other species as well, will be given in a later paper.

ACACIA EHRENBERGIANA *Hayne* (*A. flava* (Forsk.) Schweinfurth)

In 1827, Hayne described *Acacia Ehrenbergiana* and for many years this name was in use for the plant concerned. In 1896, however, Schweinfurth pointed out that *Mimosa flava* Forskal (1775) was in reality this species, and, following the priority rule, he adopted *Acacia flava* (Forsk.) Schweinfurth as the correct name. Many authorities have followed this latter course.

Schweinfurth's name, however, cannot be maintained under the Rules, as it is a later homonym of *Acacia flava* Sprengel ex DeCandolle, and Hayne's name must be reinstated.

Acacia Ehrenbergiana *Hayne* Arzneigewachse 10 (1827) t. 29.

Mimosa flava Forskal Fl. Aegypt.-Arab. (1775) 176.

Acacia flava (Forsk.) Schweinfurth in Bull. Herb. Boiss. 4, App. 2 (1896) 214, non Sprengel.

Acacia Nefasia *(Hochst. ex A. Rich.) Schweinfurth* (*A. verugera* Schweinfurth)

In 1867, in his "Acacien-arten des Nilgebiets," Schweinfurth described *Acacia verugera* as a new species. Later, in 1896, he pointed out that *Inga Nefasia* Hochstetter ex A. Richard, formerly considered as a synonym of *Acacia abyssinica* Hochstetter ex Bentham, was actually this species. The new combination which Schweinfurth made at that time seems to have been overlooked by many authorities.

Acacia Nefasia *(Hochst. ex A. Rich.) Schweinfurth* in Bull. Herb. Boiss. 4, App. 2 (1896) 209.

Inga Nefasia Hochstetter ex A. Richard Tent. Fl. Abyss. 1 (1847) 237.

Acacia verugera Schweinfurth in Linnaea 35 (1867) 340, tt. 9, 10.

Acacia nilotica *(L.) Delile* (*A. arabica* (Lam.) Willd.)

In the Species Plantarum (1753), Linnaeus included under the genus *Mimosa* two species, *M. scorpioides* and *M. nilotica*. In the second edition of the Species Plantarum (1763), Linnaeus combined these two under *Mimosa nilotica*. In 1783, Lamarck in his Encyclopédie, apparently believing that Linnaeus had confused two different species under this name, listed *Mimosa nilotica* and also described a new species *Mimosa arabica*.

In the fourth edition of the Species Plantarum (1806),

Willdenow, the first to propose subdividing the large Linnean genus *Mimosa*, transferred the species under consideration to *Acacia*. He listed *A. arabica*, but for some reason revived an old epithet of Bauhin's, *vera*, instead of accepting *nilotica* as the specific epithet. This treatment of Willdenow's, recognizing *Acacia arabica* and *Acacia vera*, was generally followed by botanists until Bentham's revision of the *Mimosae* appeared in 1842.

In 1813, however, Delile in his Florae Aegyptiacae Illustratio published the combination *Acacia nilotica* based on *Mimosa nilotica* Linnaeus.

In 1842, George Bentham contributed a series of papers to Hooker's London Journal of Botany entitled "Notes on the *Mimosae* with a synopsis of the species." In this work the author maintains only one of the two species under discussion, *Acacia arabica*, stating (page 500):

"This very variable species should probably include the *Acacia Nilotica*, and *A. vera* of different authors, if, as is maintained by many, the downy or smooth pod is not a specific distinction."

Bentham goes on to describe four varieties, based on the principal forms of the species which he had seen. These varieties are α *tomentosa*, β *Kraussiana*, γ *nilotica* and δ *indica*.

Bentham further stated his position in regard to *Acacia arabica* in his "Revision of the Sub-order *Mimosae*" which appeared in 1875 in Vol. 30 of the Transactions of the Linnean Society of London. Here (page 506) he writes:

"The specimens of this plant show so great a diversity in the indumentum, the spines, the number of pinnae, and even in the fruit, that I should readily have adopted its proposed division into at least four species could I have ascertained any consistency or correlation in the different characters."

In this work the varieties proposed in 1842 are cited as synonyms of *Acacia arabica*, as are *Acacia Adansonii* Guillemin & Perrottet and *Mimosa adstringens* Schumacher & Thonning.

The greater number of botanical works since the appearance of Bentham's first work have followed his interpretation of *Acacia arabica* as a widespread, polymorphic species with several well marked variants. Several authorities, however, have considered the variety *nilotica* to be a good species; a few have raised still others of Bentham's varieties to specific rank.

The immediate question that confronts us is the correct name under the Rules for the aggregate species. Four specific epithets are involved, *arabica*, *nilotica*, *scorpioides* and *vera*.

Acacia vera Willdenow[1] can be ruled out at once as an illegitimate name. It was superfluous when published since *Mimosa nilotica* Linnaeus, a valid name in all respects, was already in existence.

Acacia arabica (Lam.) Willdenow unfortunately must also be discarded. When Bentham united *A. arabica* (1783) and *A. vera* (1806)[*A. nilotica* (1753)] as *Acacia arabica*, he failed to take up the oldest legitimate epithet, *nilotica*. Furthermore, Bentham reduced an older specific name (*nilotica* 1753) to varietal rank under a species of a later date of publication (*arabica* 1783). This is not permissable under the present Rules. The conditions must be reversed with *Acacia nilotica* adopted as the name for the species, while *A. arabica* is reduced to varietal status. Thus for two reasons it becomes necessary to replace *Acacia arabica* by *Acacia nilotica* (L.) Delile.

The situation is further complicated by the existence of *Mimosa scorpioides* Linnaeus. At the time when some

[1] *Acacia vera* Garsault Fig. Pl. Anim. Med. (1764) t. 95; Descr. Pl. Anim. (1767) 68 is an accidental binomial and has no standing.

authorities recognized page priority this was considered to be the earliest valid name for the *arabica* complex. W. F. Wight in 1905, and A. Chevalier in 1927, each published the combination *Acacia scorpioides*, and the latter made several varietal transfers. The International Rules as amended at Amsterdam in 1935 invalidate page priority and the choice of epithets must be governed by Article 56. This states that when two groups of the same rank are united, and the names and epithets are of the same date, the author who first unites the two has the right of choosing one of the names and his choice must be followed. Linnaeus himself united *scorpioides* and *nilotica* (both 1753) under *nilotica*; consequently the latter epithet must be utilized.

From all points of view it appears necessary to take up *Acacia nilotica* (L.) Delile in place of the more familiar *Acacia arabica* (Lam.) Willdenow. This procedure has already been followed by some authorities. Among them may be mentioned Fiori, Boschi e piante legn. Eritrea (1912) 159—Fawcett and Rendle, Fl. Jamaica 4 (1920) 139—Britton and Wilson, Sci. Survey Puerto Rico & Virgin Islands (1928) 354—Britton and Rose in No. Amer. Fl. 23 (1928) 85—Chiovenda, Fl. Somal. 2 (1932) 202.

The correct nomenclature of this polymorphic species with the essential synonymy and necessary varietal transfers follows:

Acacia nilotica *(L.) Delile* Fl. Aegypt. Ill. (1813) 31.

Mimosa nilotica Linnaeus Sp. Pl. (1753) 521.
Mimosa scorpioides Linnaeus Sp. Pl. (1753) 521.
Mimosa arabica Lamarck Encycl. 1 (1783) 19.
Acacia arabica (Lam.) Willdenow Sp. Pl. 4 (1806) 1085.

Acacia vera Willdenow Sp. Pl. 4 (1806) 1085.
Acacia scorpioides (L.) W. F. Wight in Contrib. U.S. Nat. Herb. 9 (1905) 173 *in adnot.*

var. **typica**—Fiori Boschi e piante legn. Eritrea (1912) 160.

Mimosa nilotica Linnaeus Sp. Pl. (1753) 521.
Acacia vera Willdenow Sp. Pl. 4 (1806) 1085.
Acacia nilotica (L.) Delile Fl. Aegypt. Ill. (1813) 31.
Acacia arabica (Lam.) Willd. var. *Nilotica* (L.) Bentham in Hooker London Journ. Bot. 1 (1842) 500.
Acacia scorpioides (L.) W. F. Wight var. *nilotica* (L.) A. Chevalier in Bull. Soc. Bot. France 74 (1927) 954.

var. **tomentosa** *(Benth.) A. F. Hill comb. nov.*
Acacia arabica (Lam.) Willd. var. *tomentosa* Bentham in Hooker London Journ. Bot. 1 (1842) 500.
Acacia arabica sensu Guillemin & Perrottet Fl. Seneg. Tent. 1 (1832) 250 et auct. Afr. plur.
Acacia nilotica (L.) Delile var. *arabica* (Lam.) Fiori Boschi e piante legn. Eritrea (1912) 160.
Acacia scorpioides (L.) W. F. Wight var. *pubescens* A. Chevalier in Bull. Soc. Bot. France 74 (1927) 954 (varietal epithet, a *lapsus calami* for *tomentosa*, incorrectly attributed to Bentham).

Fiori (1912), while correct in reducing *Acacia arabica* to varietal status under *Acacia nilotica*, failed to take up for the new combination the earliest available varietal epithet, i.e. *tomentosa* Bentham.

var. **Kraussiana** *(Benth.) A. F. Hill comb. nov.*
Acacia arabica (Lam.) Willd. var. *Kraussiana* Bentham in Hooker London Journ. Bot. 1 (1842) 500.
Acacia Benthami DeRochebrune Toxicol. Afr. 2 (1898) 192, non Meisner.

Those authorities who consider this variety to be a good species cannot utilize DeRochebrune's name, since it is a later homonym of *Acacia Benthami* Meisner.

var. **indica** *(Benth.) A.F.Hill comb. nov.*
Acacia arabica (Lam.) Willd. var. *Indica* Bentham in Hooker London Journ. Bot. 1 (1842) 500.
Mimosa arabica Roxburgh Pl. Corom. 1 (1795) t. 149.
Acacia arabica sensu Wight & Arnott Prodr. Fl. Penin. Ind. Or. 1 (1834) 277 et auct. Ind. plur.

var. **Adansoniana** *(Dubard) A.F.Hill comb. nov.*
Acacia arabica (Lam.) Willd. var. *Adansoniana* Dubard in Henry & Ammann Acacias à Tanin (1913) 8.
Mimosa adstringens Schumacher & Thonning Beskr. Guin. Pl. (1827) 327.
Acacia Adansonii Guillemin & Perrottet Fl. Seneg. Tent. 1 (1832) 249.
Acacia arabica (Lam.) Willd. var. *Adansonii* (Guill. & Perr.) A.Chevalier in Expl. Bot. Afr. Occ. Fr. 1 (1920) 244.
Acacia scorpioides (L.) W.F.Wight var. *adstringens* (Schum. & Thonn.) A. Chevalier in Bull. Soc. Bot. France 74 (1927) 956.
Acacia arabica (Lam.) Willd. var. *adstringens* (Schum. & Thonn.) E.G.Baker Legum. Trop. Afr. (1930) 849.
Acacia nilotica (L.) Delile var. *adstringens* (Schum. & Thonn.) Chiovenda Fl. Somal. 2 (1932) 202.
Mimosa adstringens (1827) and *Acacia Adansonii* (1832) are clearly synonymous. The earlier epithet, however, is not available for use under *Acacia* since the resulting combination would be a later homonym of *Acacia adstringens* Martius. *Acacia Adansonii* Guillemin & Perrottet consequently is the correct name for this variant

when considered of specific rank. When reduced to varietal rank, the earliest epithet applied in the new rank is *Adansoniana* Dubard. Under the Rules this must be adopted rather than either *adstringens* or *Adansonii*.

Acacia Orfota *(Forsk.) Schweinfurth*
(*A. nubica* Bentham)

Bentham described *Acacia nubica* as a new species in 1842. In 1896, Schweinfurth pointed out that Forskal had described the same plant in 1775 as *Mimosa örfota*. Following the rule of priority Schweinfurth made the correct combination *Acacia Orfota* (Forsk.) Schweinfurth, a name which seems to have been rather generally overlooked by botanists.

Acacia Orfota *(Forsk.) Schweinfurth* in Bull. Herb. Boiss. 4, App. 2 (1896) 213.

Mimosa örfota Forskal Fl. Aegypt.-Arab. (1775) 177.
Acacia nubica Bentham in Hooker London Journ. Bot. 1 (1842) 498.

Acacia Raddiana *G. Savi*
(*A. tortilis* Hayne)

In northern and northeastern Africa there occur two closely related acacias with spirally twisted legumes which have been passing as *Acacia tortilis* Hayne and *Acacia spirocarpa* Hochstetter ex A. Richard. The former is a species ranging from the Anglo-Egyptian Sudan, across the Libyan and Nubian deserts to the French Sudan, Senegambia and northern Nigeria. The latter occurs in Arabia, Nubia, the Anglo-Egyptian Sudan, Eritrea, Tanganyika and Kenya. Burtt-Davy, in discussing these two species (in Kew Bull. 1930: 402), states that they may represent two species which have hybridized, or an aggregate species with a tendency to geographic segre-

gation. In either event they are distinct enough to warrant their continued maintenance as separate species, with intermediate variants.

Acacia tortilis was published by Hayne in 1827, based on *Mimosa tortilis* Forskal, which appeared in the Flora Aegyptiaco-Arabica (1775) together with a very short description. Hayne's name has continued in general use, even though the true identity of Forskal's plant, on which it was based, has long been in doubt.

In 1867, Schweinfurth (in Linnaea 35: 328) wrote as follows in regard to the identity of this plant:

> "Ob die von Hayne. . .zuerst beschriebene und abgebildete *A. tortilis* mit dem *Mimosa tortilis* Forskal's. . .identisch sei, lässt sich ohne Original-Exemplare nicht entscheiden, da, nach der Beschreibung zu urtheilen, unter diesen Namen ebenso gut die Var. α der *Acacia spirocarpa* gemeint sein könnte."

Bentham, in 1875 (in Trans. Linnean Soc. London 30: 505), stated that *Mimosa tortilis* Forskal "must be either *A. spirocarpa* or *A. tortilis*; the character given is insufficient for determination." He included Forskal's name in the synonymy of *A. spirocarpa.*

Schweinfurth again commented on this problem in 1896 (in Bull. Herb. Boiss. 4, App. 2: 207) stating:

> "*Mimosa tortilis* F. . .ist wahrscheinlich mit *A. spirocarpa* H. identisch; die allzukurze Diagnose gestattet es indessen nicht, die Möglichkeit auszuschliessen, dass darunter *A. tortilis* Hayne zu verstehen sei."

He also cited "?*Mimosa tortilis* Fk." in the synonymy of *A. spirocarpa.*

Burtt-Davy (in Kew Bull. 1930: 404) gives *Mimosa tortilis* Forsk. ? in the synonymy of *A. tortilis*, but quotes Bentham's statement that *Mimosa tortilis* Forskal "must be either *A. spirocarpa* or *A. tortilis.*"

In 1927, A. Chevalier (in Rev. Bot. Appl. 8: 125) questioned the validity of *Acacia tortilis* Hayne; discarded it on the ground that *Mimosa tortilis* Forskal was a *nomen nudum*; and adopted in its stead *Acacia fasciculata* Guillemin & Perrottet.

In 1933, Maire (in Mém. Soc. Hist. Nat. Afr. Nord 3: 118) pointed out that *Acacia fasciculata* Guillemin & Perrottet was itself untenable as it was a later homonym of both *A. fasciculata* Kunth and *A. fasciculata* R. Brown; and adopted *Acacia Raddiana* G. Savi with which to replace *Acacia tortilis* Hayne, a procedure which Chevalier followed in 1934 (in Rev. Bot. Appl. 14: 881).

Maire, however, did not discard *Acacia tortilis* Hayne for the same reason that Chevalier did. He did not consider that *Mimosa tortilis* Forskal was a *nomen nudum* in view of the fact that a description, even though a meagre one, accompanied the publication of the name. Maire's action was prompted by his belief that Forskal's name applied to a different species from the one Hayne had described, i.e. to *A. spirocarpa* Hochstetter ex A. Richard rather than to *A. tortilis* Hayne; and further, that Hayne had erroneously applied the original epithet in its new position. This belief was based in part on Christensen's "Index to Forsskal: Flora Aegyptiaco-Arabica 1775, with a Revision of the Herbarium Forsskal," and in part on a personal letter from Christensen in which the latter corroborated his published statement.

Christensen's published commentary (in Dansk Bot. Arkiv 4 (1922) 29) is not entirely clear:

"82. †Mimosa **tortilis** = *Acacia* **tortilis** (Forsk.) Hayne (A. spirocarpa Hochst.; Schwf. Beitr. 207)."

It is no wonder that Maire asked Christensen for further confirmation, which he received in a letter to which he refers (l.c. 118 *in adnot*):

"Cette identité ne ressortait pas nettement de la publication de Christensen (Index to P. Forskal: Flora. .). Mais Christensen a bien voulu nous préciser par lettre que le specimen de *M.tortilis* de Forskal a bien les légumes pubescents et est absolument identique à l' *A.spirocarpa*."

Since Christensen had access to Forskal's herbarium he was in a much better position to pass accurately on the identity of *Mimosa tortilis* than any of his predecessors, and his conclusions should carry more weight. In view of this, Maire's action in taking up *Acacia Raddiana* G.Savi for the plant which has been passing as *Acacia tortilis* Hayne is entirely logical. It is also necessary (see below) to adopt *Acacia tortilis* (Forsk.) Hayne in place of *Acacia spirocarpa* Hochstetter ex A. Richard.

In taking up *Acacia Raddiana* G.Savi for the plant which has been passing as *Acacia tortilis* Hayne, new varietal combinations will be necessary. The nomenclature of the species and its varieties follows:

Acacia Raddiana *G.Savi* Sopra alcune Acacie egiz. (1830) 1.

Acacia tortilis Hayne Arzneigewachse 10 (1827) t. 31, quoad plantam non quoad nomen; et auct. plur.
Acacia fasciculata Guillemin & Perrottet Fl. Seneg. Tent. 1 (1832) 252, non Kunth, nec R. Brown.

var. **crinita** *(Chiov.) A.F.Hill comb. nov.*
Acacia tortilis Hayne var. *crinita* Chiovenda Coll. Bot. Stef. Paoli 1 (1916) 71.

var. **pubescens** *(A.Chev.) A.F.Hill comb. nov.*
Acacia fasciculata Guill. & Perr. var. *pubescens* A. Chevalier in Rev. Bot. Appl. 8 (1928) 124.
Acacia tortilis Hayne var. *pubescens* Aylmer ex Burtt-Davy in Kew Bull. 1930 : 402.

Acacia terminalis *(Salisb.) Macbride*
(*A. elata* A. Cunningham)

When Macbride took up Salisbury's name for this plant in 1917 on the basis of priority, he wrote (in Contrib. Gray Herb. 59: 7): "It seems reasonably certain that Salisbury described the plant named much later by Cunningham." In spite of the fact that this new combination was published over twenty years ago it seems to have been entirely overlooked by botanists.

Acacia terminalis *(Salisb.) Macbride* in Contrib. Gray Herb. 59 (1917) 7.

Mimosa terminalis Salisbury Prodr. (1796) 325.

Acacia elata A. Cunningham in Hooker London Journ. Bot. 1 (1842) 383.

Acacia tortilis *(Forsk.) Hayne*
(*A. spirocarpa* Hochst. ex A. Richard)

In our discussion of *Acacia Raddiana* G. Savi it was pointed out that when Hayne published *Acacia tortilis*, based on *Mimosa tortilis* Forskal, he applied the specific epithet erroneously in its new position to a different plant. Article 54 of the International Rules of Nomenclature provides that: "When, on transference to another genus, the specific epithet has been applied erroneously in its new position to a different plant, the new combination must be retained for the plant on which the epithet was originally based."

Maire (in Mém. Soc. Hist. Nat. Afr. Nord 3 (1933) 118) was the first to point out that under the Rules the combination *Acacia tortilis* must be used in place of *Acacia spirocarpa* Hochstetter ex A. Richard. He writes:

"Or l'étude du spécimen original de Forskal a permis à Christensen d'établir l'identité de la plante de cet auteur avec *l'Acacia spirocarpa* Hochst. in Rich. Ce dernier doit donc prendre, en conformité

avec les règles de la nomenclature le nom *d'Acacia tortilis* (Forsk.) Christensen in litteris; non Hayne."

In 1935 at Amsterdam, Article 54 was amplified to provide that the new combination "must be attributed to the author who first published it." Consequently the correct name, as the Rules now stand, for the familiar *Acacia spirocarpa* Hochstetter ex A. Richard is *Acacia tortilis* (Forsk.) Hayne.

It is unfortunate that two names of such long standing as *Acacia tortilis* Hayne and *A. spirocarpa* Hochstetter ex A. Richard cannot be maintained with their familiar connotation, but this is impossible. Perhaps at some future date the situation may be clarified. In 1934, Chevalier (in Rev. Bot. Appl. 14: 882), commenting on *Acacia spirocarpa*, made the following suggestive statement:

"Il semble que c'est une espèce très peu distincte de *A. Raddiana* et le nom de *A. tortilis* Hayne est sans doute à conserver comme espèce linéenne englobant les deux bonnes précédentes comme sousespèces."

The essential nomenclature of this species and its variety follows:

Acacia tortilis *(Forsk.) Hayne* Arzneigewachse 10 (1827) t. 31, quoad nomen non quoad plantam.

Mimosa tortilis Forskal Fl. Aegypt.-Arab. (1775) 176.

Acacia spirocarpa Hochstetter ex A. Richard Tent. Fl. Abyss. 1 (1847) 239.

Acacia spirocarpa Hochst. ex A. Rich. var. *β major* Schweinfurth in Linnaea 35 (1867) 323, t. 5.

var. **minor** *(Schweinf.) A. F. Hill comb. nov.*

Acacia spirocarpa Hochst. ex A. Rich. var. *α minor* Schweinfurth in Linnaea 35 (1867) 323, tt. 4, 6.

Acacia gummifera Delile Fl. Aegypt. Ill. (1813) 31, non Willd.

ORCHID STUDIES, XI

BY

LOUIS O. WILLIAMS

NEW SPECIES OF EPIDENDRUM AND DENDROBIUM

THE PRESENT paper contains a description of an Epidendrum from Honduras and a Dendrobium from Burma.

Epidendrum (§ Euepidendrum) **dilochioides** *L. O. Williams sp. nov.*

Herbae probabiliter caespitosae, epiphyticae, usque ad 3 dm. vel ultra altae. Caulis simplex. Folia elliptica vel elliptico-oblanceolata, obtusa, coriacea. Inflorescentia racemus pauciflorus. Sepala ovato-lanceolata, obtusa, carnosa. Petala late oblanceolata, paulo obliqua, obtusa. Labellum plusminusve orbiculare, trilobatum, bicallosum; lobus medius parvus, inconspicuus, mucroniformis. Columna generis.

Probably caespitose, epiphytic herbs up to 3 dm. or more tall. Stems 5–8 mm. in diameter, unbranched, covered with the old leaf bases. Leaves 6–11 cm. long and 1.5–2.8 cm. broad, elliptic to elliptic-oblanceolate, obtuse, coriaceous, deciduous; leaf-sheaths persisting, finally shredding. Inflorescence a short, few-flowered (about 8-flowered) raceme nearly equalling or shorter than the subtending leaves; bracts 1.5–3 cm. long, 1–2 cm. broad, ovate, acute, chartaceous, navicular, nearly as long as the flowers. Sepals about 11 mm. long and 5 mm. broad, ovate-lanceolate, obtuse, fleshy, with three principal nerves. Petals about 10 mm. long and 4 mm. broad, broadly oblanceolate, somewhat oblique, obtuse with three principal nerves. Lip about 10 mm. long and 11 mm. broad, nearly orbicular in outline, fleshy, 3-lobed, with two small carinae extending from the apex of the

column toward the middle of the lamina; the mid-lobe very small and inconspicuous, hardly more than an obtuse mucro. Column about 4 mm. long, straight, adnate to the lip.

HONDURAS: "west coast of Honduras," September 1939. *Bevan s.n.* (TYPE in Herb. Ames No. 57285).

Epidendrum dilochioides is closely allied to *E. estrellense* Ames, a Costa Rican species from which it may be distinguished as follows:

Epidendrum dilochioides	*Epidendrum estrellense*
Lip not cordate at the base.	Lip cordate at the base.
Floral bracts 15-30 mm. long.	Floral bracts about 12 mm. long.
Leaves obtuse.	Leaves acute.
Lamina of the lip with two carinae which extend only to the middle.	Lamina of the lip tricarinate, the middle carina extending to the apex.

The mid-lobe of the lip in both species is very inconspicuous.

The specific name of *Epidendrum dilochioides* is suggested by the resemblance of the floral bracts to those of some species of *Dilochia.*

Dendrobium (Subg. Dendrocoryne) **Dickasonii** *L. O. Williams sp. nov.*

Herbae caespitosae, parvae, usque and 4 cm. altae. Caulis clavellatus, 2–4-articulatus. Folia elliptico-lanceolata. Inflorescentia uniflora. Flores pro plantas grandes. Sepalum dorsale lineari-oblongum, obtusum, quinquenervium. Sepala lateralia lineari-lanceolata, acuta, quinquenervia. Petala lineari-lanceolata, obtusa, quinquenervia. Labellum integrum, ovato-lanceolatum, obtusum vel leviter acutum, trilamellatum. Columna generis.

Small, caespitose, epiphytic herbs with stems up to

about 4 cm. long and with comparatively large orange (yellow when dry) flowers. Stems 1–4 cm. long, 2–7 mm. in diameter, clavellate, swollen, with two to four articulations. Leaves on flowering specimens immature, elliptic-lanceolate, the largest seen about 25 mm. long and 6 mm. broad. Inflorescence 1-flowered, the flower apparently arising from the top of the articulation of the previous year's growth, hence subterminal. Flowers large for the plant; mentum short and obtuse. Dorsal sepal 21–25 mm. long, 3–4 mm. broad, linear-oblong, obtuse, 5-nerved. Lateral sepals 25–30 mm. long, 3.5–5 mm. broad, linear-lanceolate, acute, 5-nerved, shortly connate at the base and forming a mentum 4–5 mm. long. Petals 25–30 mm. long, 2.5–4 mm. broad, linear-oblanceolate, obtuse, 5-nerved. Lip about 25–30 mm. long and 7–11 mm. broad, entire, ovate-lanceolate, obtuse or acutish, with three lamellate ridges extending 7–8 mm. from the base, continued beyond the lamellae as papilliferous excrescences. Column about 2 mm. long; column-foot about 5 mm. long, with contiguous wings.

BURMA: rare epiphyte on Rhododendron, near Haka, at 1800 meters altitude, flowers orange, April 28, 1938, *Dickason 7779* (TYPE in Herb. Ames No. 53685).

There do not seem to be any closely allied species. *Dendrobium Dickasonii* apparently belongs in Kränzlin's section Superbienta of the subgenus Dendrocoryne.

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THE GENUS PALMORCHIS

BY
CHARLES SCHWEINFURTH AND DONOVAN S. CORRELL

THE HISTORY of the genus Palmorchis is not only interesting but instructive. In 1877, this genus, including two species, *P. pubescens* and *P. sobralioides*, both natives of Brazil, was proposed by Barbosa Rodrigues.

In 1898, R. A. Rolfe published *Jenmania* typified by *Jenmania elata*, a plant of Trinidad and British Guiana. In the same year, Zahlbruckner changed the name *Jenmania* to *Rolfea* in honor of Rolfe, because the name *Jenmania* was preoccupied by that of a lichen.

In the original diagnosis of *Jenmania elata*, Rolfe compared it with the genus *Palmorchis* and considered it to be distinct. However, in view of a later published figure and description of *Rolfea elata* (Hook. Icon. Pl. 10, pt. 4 (1913) t. 2989), the separation of these two concepts seems to us unjustifiable.

In a comparison between the description of *Palmorchis pubescens* and of *Rolfea elata*, the only significant differences appear to be that in *Palmorchis* the petals are described and illustrated as being slightly broader than the sepals and the clinandrium as being provided on each side with a small tooth—characters which do not appear in *Rolfea*.

In 1901, Cogniaux referred the two species described under *Palmorchis* to *Sobralia* naming them *S. pubescens* and *S. Rodriguesii*. It seems to us inconceivable, how-

ever, that these two small-flowered plants, strikingly distinguished by having the disc of the lip strongly adnate to the lower part of the column, should be included in *Sobralia* which commonly has large flowers and a lip which is entirely free from the column. In his description of *Sobralia pubescens*, however, Cogniaux did much toward clarifying our problem, not only by amplifying the original description of *Palmorchis pubescens*, but even more by including a floral analysis of the plant.

In 1920, Schlechter proposed the concept *Neobartlettia*. Despite its characterization of being different in habit from *Rolfea* and having a lip which is free from the column, the genus actually shows in its component species a habit very similar to *Rolfea*, as well as to the other members of the *Palmorchis* group, and a lip of which the disc is always distinctly adnate to the lower part of the column. In fact, this adnation is quite evident in a flower taken from an isotype of *Neobartlettia Kuhlmannii* Schltr., and such adnation is specified in the original description of *N. lobulata* Mansf.

Palmorchis (as we understand it) is a small genus of orchids thus far consisting of only six species centering in northern South America and extending to Trinidad and Panama.

In vegetative appearance this genus resembles *Corymborchis* and *Tropidia*, but is readily separated from them by the adnation of the lower part of the disc of the lip to the column. This adnation of the lip to the column recalls the structure of the flowers in the genus *Vanilla*; however, the habit of *Palmorchis* and *Vanilla* is very dissimilar.

According to Pfitzer's systematic key to the Orchidaceae (in Engler and Prantl Die Natürlichen Pflanzenfamilien), *Palmorchis* is in part referable to the Tropidieae (containing *Tropidia* and *Corymborchis*). In the structure

of the column, however, this genus is widely divergent from the Tropidieae. In *Palmorchis* the anther is not erect on the back of the column, nor are the pollinia distinctly powdery as in the Tropidieae; but the anther is incumbent lying on the rostellum on the anterior face of the column and the pollinia appear to be more or less waxy or at least not readily pulveraceous.

According to Schlechter (Das System der Orchidaceen, in Notizbl. Bot. Gart. Berlin 9 (1926) 563), the genera *Rolfea* and *Neobartlettia* [= *Palmorchis*] fall into the Polychondreae (with soft, granular pollinia) and then into the subtribe Tropidieae. In this treatment, Schlechter makes the error of including the concepts *Rolfea* and *Neobartlettia* (with incumbent anthers) in the group with *Tropidia* and *Corymborchis* which have erect anthers. Of even more basic importance, it seems to us, the concept *Palmorchis*, as represented by *Rolfea Powellii*, has pollinia which are not powdery as in the Tropidieae but are somewhat waxy or at least not readily pulveraceous. On this basis, following Schlechter's system, the genus *Palmorchis* should be referred to the tribe Kerosphaereae and then to the subtribe Liparideae. But obviously the genera of the Liparideae are widely dissimilar to the concept *Palmorchis*.

In 1937, Mansfeld (Über das System der Orchidaceae-Monandrae, in Notizbl. Bot. Gart. Berlin 13, p. 666) excluded *Rolfea* and *Neobartlettia* from the Tropidiinae (or Tropidieae). He placed them in the tribe Kerosphaereae, and then with some uncertainty in the subtribe Sobraliinae.

It thus appears that, whatever system of classification we attempt to use, *Palmorchis* occupies an uncertain position. The genus seems to stand alone and we propose for it the subtribal name Palmorchideae to be placed in the proximity of the Liparideae.

The scarcity of herbarium material in this genus has made it difficult to arrive at satisfactory conclusions concerning the specific delimitations of some of the concepts.

Palmorchis *Rodrigues* Gen. & Sp. Orch. Nov. 1 (1877) 169.

Jenmania Rolfe in Kew Bull. 1898: 198, non Wächter in Flora 84 (1897) 349.

Rolfea Zahlbruckner in Journ. Bot. 36 (1898) 493.

Neobartlettia Schlechter in Fedde Repert. 16 (1920) 440.

Perianth campanulate or connivent. Sepals and petals similar, oblanceolate or oblong-oblanceolate (petals rarely linear). Lip much broader than the other segments, more or less distinctly 3-lobed above the middle or at the apex, adnate to the lower part of the column by the central part of the disc; disc pilose or glabrous, adorned with thickened nerves or calli. Column long and slender, arcuate above; clinandrium short, concave; rostellum short, convex; stigmatic orifice transversely oval. Anther terminal, opercular, incumbent, hemispheric-conic, 2-celled. Capsule slender, elongate, terete, with the column persistent.—Tall, terrestrial, caespitose herbs with the habit of *Corymborchis*. Leaves several, elliptic or elliptic-lanceolate, plicate with several prominent nerves. Inflorescence terminal or lateral or both, either racemose or paniculate.

KEY TO THE SPECIES AT PRESENT RECOGNIZED

Flowers more than 1.5 cm. long

Mid-lobe of the lip minute, triangular-ovate; disc with 4 tubercles toward the apex — 6. *P. sobralioides*

Mid-lobe of the lip conspicuous, transverse, retuse or bilobed; disc without tubercles

Flowers about 1.7 cm. long; disc of lip with 5 longitudinal lamellae — 4. *P. Powellii*

Flowers about 2 cm. or more long; disc of lip with 3 central thickened nerves, at least above — 5. *P. pubescens*

Flowers less than 1.2 cm. long

Mid-lobe of the lip obovate-reniform, retuse or bilobed and apiculate — 3. *P. pandurata*

Mid-lobe of the lip triangular or ligulate, entire

Disc of the lip round-obovate in outline; mid-lobe narrowly ligulate — 1. *P. guianensis*

Disc of the lip cuneate with a subtruncate apex; mid-lobe broadly triangular — 2. *P. lobulata*

1. **Palmorchis guianensis** *(Schltr.) Schweinfurth & Correll comb. nov.*

Neobartlettia guianensis Schlechter in Fedde Repert. 16 (1920) 441.

Neobartlettia Kuhlmannii Schlechter in Beihefte Bot. Centralbl. 42, Abt. 2 (1925) 76.

The only notable difference between *Neobartlettia Kuhlmannii*, of which we have seen an isotype, and *N. guianensis*, represented by apparently authentic material, consists in the shorter and narrower leaves of *N. Kuhlmannii*. In the flowers of the latter concept, the column is glabrous (as described in *N. guianensis*) and not pilose in front as stated for *N. Kuhlmannii*. Also, the mid-lobe of the lip is carinate-thickened, as described in *N. guianensis*. This species is found in British Guiana and Brazil.

2. **Palmorchis lobulata** *(Mansf.) Schweinfurth & Correll comb. nov.*

Neobartlettia lobulata Mansfeld in Notizbl. Bot. Gart. Berlin 10 (1928) 237.

This species is closely allied to *P. guianensis* and, when additional material becomes available, it may prove to be conspecific. It is found in Peru and Colombia.

3. **Palmorchis pandurata** *Schweinfurth & Correll sp. nov.*

Herba caespitosa, robusta. Radices fibratae, valde tomentosae. Caules in parte inferiore vaginis cylindraceis arctis omnino obtecti, in parte superiore laxe foliati. Folia plura, elliptica vel oblongo-elliptica, acuminata, submem-

branacea, nervis pluribus conspicuis praedita, laminis infimis et supremis multo minoribus. Inflorescentia terminalis, leviter paniculata. Pedunculi pars inferior gracilis, flexuosa; pars superior dense pluriflora, bractea oblongo-elliptica subtenta. Bracteae oblongo-lanceolatae, nervosae, patentes. Flores parvi. Sepalum dorsale anguste oblanceolato-oblongum, naviculare, subobtusum. Sepala lateralia lineari-oblanceolata, obliqua, valde navicularia, acuta, dorso carinata. Petala falcato-linearia. Labellum columnae basi alte adnatum, in laminam obovato-panduratam expansum; lamina leviter trilobata; lobi laterales complanato-semiobovati, antice subacuti; lobus intermedius obovato-reniformis, valde retusus cum apiculo; discus callo U-formi crasso ornatus. Columna gracilis, superne leviter arcuata, glabra, antice concava.

Plant caespitose, coarse, glabrous, with numerous long fibrous roots which are densely tomentose, 6 dm. tall. Stem robust, terete, up to 3.9 dm. long, 4–5 mm. in diameter, provided below with scarious appressed tubular sheaths, loosely 4- or 5-leaved above. Leaves large, elliptic or elliptic-oblong, acute or shortly acuminate, conspicuously 9- to 13-nerved, up to 27.5 cm. long and 8 cm. wide, the lowermost and uppermost often much smaller, plicate, submembranaceous, abruptly tapering into the sheathing petioles of which the bases are imbricating. Inflorescence terminal, lax and flexuous, up to 10 cm. long; peduncle filiform, provided above the middle with a narrowly lanceolate foliaceous bract which is up to 5.6 cm. long; flowers dense, more or less paniculate. Floral bracts ovate to oblong-lanceolate, shortly acuminate, concave, membranaceous, with five or more conspicuous light brown nerves, 8–12 mm. long, 2–3 mm. wide below the middle. Flowers small. Dorsal sepal narrowly oblanceolate-oblong, subobtuse, navicular especially above, dorsally carinate with the keel sparingly ciliate, 5-nerved,

with cross-veins above the middle, about 7.5 mm. long and 1.5 mm. wide. Lateral sepals narrowly and obliquely oblanceolate-oblong, subobtuse, strongly navicular especially above, dorsally carinate with the sparingly ciliate keel broadened near the apex and extending as an apicule, 5-nerved, with cross-veins above the middle, 6.6–7 mm. long, about 1.5 mm. wide near the apex. Petals linear-falcate, subacute to shortly acute, 3-nerved, with a few cross-veins near the apex, about 6.5 mm. long. Lip adnate to the column by a thickened mid-nerve for almost one third the length of the lamina, obovate-pandurate in outline from a narrowly cuneate pubescent base, 6.6 mm. long; lateral lobes shallowly semiobovate, subacute in front with the anterior margins fleshy-thickened, the lower margins ciliate, upturned and clasping the column in natural position, about 3 mm. wide across the lobes when spread out; mid-lobe obovate-reniform, retuse or bilobed and apiculate with the lobes spreading and irregularly erose-ciliate, about 3 mm. wide; disc pubescent at the base, with conspicuously branching veins above, provided in the constricted portion with a U-shaped fleshy callus and a more or less distinct fleshy thickening between the lateral arms of the callus. Column slender, glabrous, with two narrow lateral wings on the anterior surface, somewhat arcuate above, about 6 mm. long; anther terminal, semiorbicular-conic, incumbent, operculate with a slender hinge, 2-celled.

In regard to the flowers, *Palmorchis pandurata* has a lip resembling in size that of *P.guianensis* but in outline the lip suggests that of *P.pubescens*.

TROPICAL AMERICA: S.Joseoito[1], Lehmann B.T. 48 (TYPE in Herb. Gray No. 2083; ISOTYPE in Herb. N.Y. Bot. Gard.).

[1]The exact location of this place could not be ascertained. However, we did learn from authorities in Colombia that the place is not in that country.

EXPLANATION OF THE ILLUSTRATION

PALMORCHIS PANDURATA *C. Schweinf. & Correll.* 1, plant, one half natural size. 2, inflorescence, three fourths natural size. 3, flower, from side, five times natural size. 4, column, from side, five times natural size. 5, lateral sepal, five times natural size. 6, dorsal sepal, five times natural size. 7, petal, five times natural size. 8, lip, expanded, five times natural size.

Drawn February 1940 by G. W. DILLON

1
2
3
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PALMORCHIS
pandurata
C. Schweinf. & Correll
GORDON W. DILLON

4. **Palmorchis Powellii** *(Ames) Schweinfurth & Correll comb. nov.*

Rolfea Powellii Ames in Sched. Orch. 7 (1924) 32, fig. 6.

This species is readily distinguished from *Palmorchis pubescens*, to which it is most closely allied, by its smaller stature, smaller flowers and 5-lamellate lip. It is found in Panama.

5. **Palmorchis pubescens** (as pubescentis) *Rodrigues* Gen. & Sp. Orch. Nov. 1 (1877) 170.

Jenmania elata Rolfe in Kew Bull. 1898: 198.

Rolfea elata Zahlbruckner in Journ. Bot. 36 (1898) 493.

Sobralia pubescens Cogniaux in Martius Fl. Bras. 3, pt. 5 (1901) 347, t. 73, fig. 2.

This species, which is the type of the genus, is the largest and most robust plant of the group, both vegetatively and florally. It is found in Trinidad, British Guiana and Brazil.

According to Rodrigues, this species is commonly known by the natives as *Baunilhasinha*, Little Vanilla.

6. **Palmorchis sobralioides** (as Sobralioidis) *Rodrigues* Gen. & Sp. Orch. Nov. 1 (1877) 170.

Sobralia Rodriguesii Cogniaux in Martius Fl. Bras. 3, pt. 5 (1901) 340.

Neobartlettia sobralioides Schlechter in Fedde Repert. 16 (1920) 441.

This species is characterized by its narrowly triangular-obovate lip which is about 12 mm. long and 8 mm. wide. It is lightly 3-lobed above with a short triangular-ovate mid-lobe. It is found in the province of Para, Brazil.

NOMENCLATURE OF THE AMERICAN SPECIES OF CORYMBORCHIS

BY

DONOVAN S. CORRELL

AT THE present time two species of *Corymborchis* are recognized in the Western Hemisphere: *Corymborchis flava* (Sw.) O. Ktze.—plants with yellow flowers having a lanceolate lip, and *Corymborchis cubensis* Acuña—plants with greenish or greenish white flowers having a linear-spatulate lip. A study of these species has revealed a most puzzling and interesting nomenclatorial history.

I. CORYMBORCHIS FLAVA *(Sw.) O. Ktze.*

In 1788, Swartz (Nov. Gen. & Sp. Pl. Prodr., p. 119) briefly described *Serapias flava*, a Jamaican plant having yellow flowers. Later, in 1806 (Fl. Ind. Occ., p. 1417), he changed the name of this plant to *Neottia flava* and supplemented his earlier description with an excellent and more detailed account of the plant. In writing of the lip he said, "*Labellum* basi canaliculato-concavum, columnam amplectens, *lamina* longitudine petalorum, lanceolata, erecta, nec apice recurva."

In 1840, Lindley (Gen. & Sp. Orch. Pl., p. 484) described *Chloidia decumbens*, a Brazilian plant having flowers with a lanceolate lip. He stated that the sepals were yellow and the petals white with the outer surface yellow. At the same time Lindley cited Swartz's species as possibly synonymous with his own. He wrote:

"I am uncertain whether this plant is the same as Swartz's *Neottia flava*. So far as the description given by that author is concerned, there is no material discrepancy; except that he says the leaves of his plant are 2 or 3 feet long. Here they are not a foot in length. But if the stem of *N. flava* is erect, and the petals of the same

coulour as the sepals, as seems to be implied, then it is probable that the West Indian plant forms a distinct species."

What basis Lindley had for his comments on the length of the leaves and the manner of growth of the stem in Swartz's plant is not clear. Swartz, so far as we know, did not mention the exact length of the leaves of his specimen. However, he did state that the stem of his plant was "geniculato"—not erect. In these two concepts the color of the flowers seems to have been identical.

Although it should have been evident that both Swartz and Lindley were concerned with the same species when they wrote their individual descriptions, authors, with few exceptions, have continued to maintain both names. Lindley's *Chloidia decumbens* has been accepted for South American plants; whereas Swartz's *Serapias flava*, in turn, has been adopted for West Indian and Central American plants. This arbitrary acceptance of these two names has not only resulted in utter confusion in literature, but has retarded a realization of the true identity of the species of *Corymborchis* in this hemisphere.

In 1891, Otto Kuntze (Rev. Gen. Pl. 2, p. 658) combined these two concepts, which have yellow flowers with a lanceolate lip, under the new combination, *Corymborchis flava*.

Corymborchis flava *(Sw.) O. Kuntze* Rev. Gen. Pl. 2 (1891) 658.

Serapias flava Swartz Nov. Gen. & Sp. Pl. Prodr. (1788) 119.

Neottia flava Swartz Fl. Ind. Occ. (1806) 1417.

Chloidia decumbens Lindley Gen. & Sp. Orch. Pl. (1840) 484.

Macrostylis decumbens Reichenbach filius in Bonplandia 2 (1854) 11.
Chloidia flava Reichenbach filius in Walpers Ann. Bot. 6 (1863) 644.
Corymbis flava Hemsley in Godman & Salvin Biol. Centr.-Amer. Bot. 3 (1884) 297.
Corymbis decumbens Cogniaux in Martius Fl. Bras. 3, pt. 4 (1895) 276.

The lip, the character of greatest diagnostic importance in *Corymborchis flava*, is broadly lanceolate, canaliculate, 7-nerved, dorsally carinate along the mid-nerve, about 14 mm. long and 5–6 mm. wide below the middle. It is broadly rounded on each side at the base and has an acute, minutely undulate apex. The disc has a linear intramarginal callus on each side extending from the base almost to the apex.

Corymborchis flava is found in the West Indies, Costa Rica, El Salvador (?), Panama and South America.

SPECIMENS EXAMINED:

COSTA RICA: Prov. Cartago, Cartago, at 1300 meters alt., April 1888, *Juan J. Cooper 5999* (Gray Herb. & U.S. Nat. Herb.); Finca Navarro, at 1350 meters alt., May 21–23, 1906, *W.R.Maxon 644* (Herb. N.Y. Bot. Gard.); Peralta, tall terrestrial orchid, in deep forest, May 6, 1926, *C.H.Lankester 1127* (Herb. Ames); Navarro, tall terrestrial (3 ft.), on wooded hillside of Atlantic slope, at 2000–4000 feet alt., March 12, 1929, *C.H.Lankester 1243* (Herb. Ames).

EL SALVADOR: Sierra de Apaneca, in the region of Finca Colima, "Coyolillo", erect, 2-4 ft. high, in forest, Departamento de Ahuachapán, Jan. 17-19, 1922, *P.C.Standley 20132* [flowers poor] (Herb. Ames & U.S. Nat. Herb.). [Owing to the advanced condition of this collection the determination is open to question.

CUBA: Santa Catalina, terrestrial, 3–4 ft. high, Jan. 28, 1907, *C.F.Baker 970* (Herb. N.Y. Bot. Gard.); Oriente, Sierra Maestra, slopes of "El Gigante," a rather isolated top southeast of Bayamo on Rio Guisa, on the ground, at about 800 meters alt., Jan. 2, 1923, *E.L.Ekman 16070* (Herb. N.Y. Bot. Gard.); Suinor del Rio, 2 meters

high, in moist woods on limestone rocks at 480 meters alt., Rangel Mts., Aug. 1929, *Bro. Leon 14089* (Herb. N.Y. Bot. Gard.); Province of Santa Clara, Buenos Aires, Trinidad Hills, at 2500–3500 feet alt., Glen Ames (Mt. Harvard), July 24, 1930, *J.G.Jack 8078* (Herb. Ames).

GUADELOUPE: Terrestrial, rare, very humid places in woods, Bains Jaunes, 1895, *Père Duss 3813* (Gray Herb., U.S. Nat. Herb. & Herb. N.Y. Bot. Gard.).

PANAMA: Province of Chiriquí, terrestrial, flowers light cadmium, Llanos on slopes of Volcán de Chiriquí Viejo and along Río Chiriquí Viejo, at 1200 meters alt., April 20, 1935, *P.H.Allen 1009* (Herb. Ames).

COLOMBIA: Santa Marta, Onaca estate, erect, 3-4 ft. tall, two roots only observed in gully in mountain forest, 1898-1901, *H.H.Smith 2636* (Gray Herb. & Herb. N.Y. Bot. Gard.); Dept. Caldas, Rio Santa Rita, Salento, dense forest, at 1600-1800 meters alt., perianth yellow, July 29, 1922, *E.P.Killip & T.E.Hazen 8982*, (Gray Herb.); Dept. Caldas, "Canaan", south of Salento, forest, at 1400-1700 meters alt., perianth yellow, July 31, 1922, *F.W.Pennell 9061* (Herb. Ames).

VENEZUELA: prope coloniam Tovar, 1856-7, *A.Fendler 1397* (Gray Herb.).

BRAZIL: Sta. Catharina, Rio Uruguay (Statio viae ferreae) in silva prim. ad terram, c. 400 m., Feb. 25, 1916, *P. Dusén 17790* (Gray Herb.); Queluz-S. Paulo, 1916, *P.Campos Porto 225* (Herb. Ames); S.Paulo, Serra Negra, Planta da matta, June 6, 1927, *F. C. Hoehne 31593* (Herb. N.Y. Bot. Gard.).

PARAGUAY: in regione fluminis Alto Paraná, 1909-1910, *K.Fiebrig 6463* (Herb. Ames, Gray Herb., & U.S. Nat. Herb.); Cerro Scahay, in silva terrestre, petala flava, Dept. Altos, April 1920, *T. Rojas* (Herb. Ames).

II. CORYMBORCHIS CUBENSIS *Acuña*

In 1939, Acuña included *Corymborchis flava* in his treatment of the Cuban orchids and also described a new species, *Corymborchis cubensis*, a plant whose greenish or greenish white flowers have a linear-spatulate lip.

It seems strange that the identity of this species was

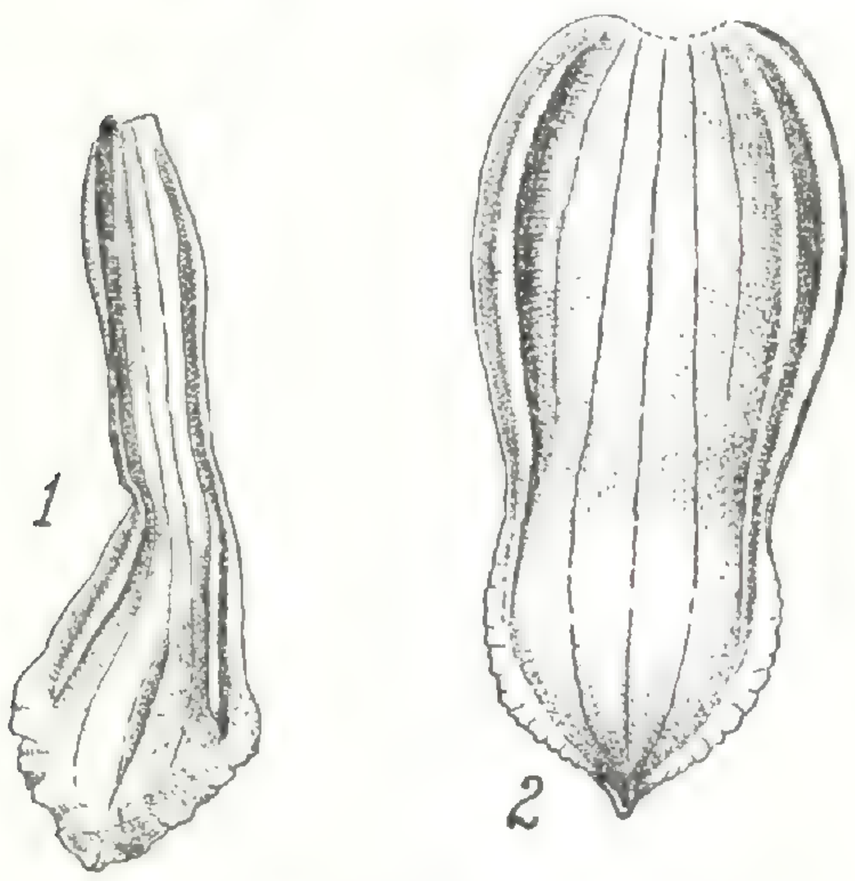
not recognized prior to 1939, as specimens of it have been available in herbaria for more than one hundred and fifty years and it has been referred to in literature for about seventy-five years.

It is regrettable that Acuña's description of the species lacks a Latin diagnosis and consequently, according to the International Rules of Botanical Nomenclature, the name is not recognized as published. In order to validate Acuña's name, "cubensis", a Latin diagnosis and an amplified description are here given.

Corymborchis cubensis *Acuña* in Estac. Exper. Agrón. Bol. Téc. 60 (Cat. descr. Orquíd. Cub.) (1939) 51, ampl. *Correll.*

Corymbis flava Hemsl. sensu Cogniaux in Urban Symb. Antill. 6 (1909) 365. (exclude synonymy). *Chloidia flava* Griseb. Fl. Brit. West Ind. (1864) 643. (as to description, not as to synonomy).

Planta robusta, elata. Caulis teres, erectus vel decumbens. Folia ampla, disticha, lanceolato-elliptica vel anguste lanceolata, longe acuminata, sessilia, plicata, prominenter nervosa. Inflorescentiae laterales, ex foliorum axillis exorientes, paniculatae; pedunculi graciles, squamosi. Bracteae inflorescentiae ovato-triangulares vel lanceolatae, acutae vel acuminatae, concavae. Flores arcuati, patuli. Sepalum dorsale lineare vel lineari-oblanceolatum, acutum vel acuminatum, car-



1. *Corymborchis cubensis*, lip, three and one half times natural size.
2. *Corymborchis flava*, lip, three and one half times natural size.

Drawn March 1940 by G.W.Dillon

nosum, canaliculatum, dorso carinatum. Sepala lateralia lineari-oblanceolata, acuta vel acuminata, falcata, canaliculata, dorso carinata. Petala linearia vel oblanceolata, acuta vel acuminata, obliqua, dorso carinata. Labellum erecto-patulum, in positu naturali supra medium arcuato-decurvatum, in laminam lineari-spathulatam expansum, acutum, canaliculatum, dorso carinatum; discus bicallosus, calli intramarginales lineares. Columna clavellata. Capsula cylindracea.

Plant simple, tall, stout, erect, up to 2 meters high, leaf-sheaths peduncles and lower surface of the young leaves usually lepidote with brownish scales. Stem terete, occasionally geniculate at the base. Leaves large, crowded on the upper part of the stem, elliptic-lanceolate to narrowly lanceolate, long-acuminate, distichous, sessile, plicate and conspicuously many-nerved, 15–45 cm. long, 3–7.5 cm. wide. Inflorescences one to three lax corymbose panicles, arising in the axils of the uppermost leaves, up to 12 cm. long; peduncle slender, usually somewhat lepidote, up to 8.5 cm. long. Floral bracts ovate-triangular to lanceolate, acute to acuminate, concave and clasping at the base, 3–18 mm. long, 2–3 mm. wide near the base, those subtending the branches of the inflorescence longest. Flowers greenish white or white, arcuate, spreading. Sepals canaliculate, fleshy-thickened, conspicuously dorsally carinate along the mid-nerve; dorsal sepal linear to linear-oblanceolate, acute or shortly acuminate, incurved, 12–19 mm. long, 2–2.5 mm. wide above the middle; lateral sepals linear-oblanceolate, acute or abruptly and shortly acuminate, in natural position prominently falcate-recurved, 10–15 mm. long, 2–2.5 mm. wide above the middle. Petals obliquely linear to oblanceolate, acute or abruptly and shortly acuminate, somewhat dilated and concave at the apex with the margins crisped, thinner than the sepals, conspicuously dorsally carinate along the

mid-nerve, 11–13.5 mm. long, 2.5–3.5 mm. wide above the middle. Lip in natural position arcuate-decurved above the middle, when spread out linear-spatulate, acute, cucullate-concave and rounded at the base, dorsally carinate along the thickened mid-nerve, 11–14 mm. long; basal portion linear, canaliculate, 6–8 mm. long, 1.5–3 mm. wide; apical portion dilated, ovate to oval, reflexed, with the margins usually undulate-crisped, 5–6 mm. long, 3–4.5 mm. wide; disc with an intramarginal linear callus on each side extending from the base to about the middle of the apical portion. Column clavellate, terete below, 10–12 mm. long. Capsule cylindrical, ribbed, 1.5–2 cm. long.

Corymborchis cubensis is found throughout the West Indies, Mexico and Central America.

SPECIMENS EXAMINED:

MEXICO: pr. Mirador, in sylvis umbrosis pinus, March 1842, *Liebmann 6769* (U.S. Nat. Herb.); Mirador, March 1847, *Lehmann 13.15.16* (Gray Herb.); Vera Cruz, Mt. Armalonga, east of Tezonapa, Cordova-Tierra Blanca, very shady parts in virgin forest, in tough peaty soil, grows up to 2 meters high, fls. greenish white, at 550 meters alt., Jan. 5, 1934, *Otto Nagel 3585* (Herb. Ames); Vera Cruz, Mt. Armalonga, near Tezonapa, virgin forest in peaty soil, fls. greenish white, at 500 meters alt., Nov. 12, 1934, *Otto Nagel & Juan G. 4105A* (Herb. Ames).

GUATEMALA: Alta Verapaz, im Walde von Pansamalá, 1300 meters alt., Sept. 1886, *H. von Tuerckheim 1021* (Herb. Ames & U.S. Nat. Herb.); Alta Verapaz, Cubilgüitz, 350 m. alt., auf losem humusreichem Waldboden, Nov. 1903, *H. von Tuerckheim 8601* (U.S. Nat. Herb.).

COSTA RICA: El Silencio, at 800 meters alt., July 5, 1923, *J. Valerio 143* (U.S. Nat. Herb.).

CUBA: prope villam *Monte Verde* dictam, Cuba Orientali, Jan.-Jul. 1859, *C. Wright 1471* (Gray Herb.); 1860-1864, *C. Wright 3312* (Gray Herb.); El Yunque, Mt. Baracoa, 5 feet tall, March 1903, *L. M. Underwood & F.S. Earle 685* (Herb. N.Y. Bot. Gard.); Oriente, Faral-lon de La Perla, plant 3.5 dm. tall, flowers greenish, Feb. 14, 1911,

J.A.Shafer 8763 (Herb. N.Y. Bot. Gard.); Oriente, side and top of El Yunque, Dec. 20, 1910, *J. A. Shafer 8001* (TYPE in Herb. N.Y. Bot. Gard.; DUPLICATE TYPE in Herb. Ames No. 14353); Loma del Gato, Sierra Maestra, Dec. 1920, *Fre. Clement 489* (Herb. N.Y. Bot. Gard.); Pinar del Rio, Pan de Gualjaibón, highest mountain of Sierra de los Organos, northern slope, in forest, on ground, Jan. 9, 1921, *E.L.Ekman 12753* (U.S. Nat. Herb.).

HAITI: Massif du Nord, Port-de-Paix, Haut-Piton, hard limestone, at 1100 meters alt., Sept. 19, 1925, *E. L. Ekman 4860* (Herb. Ames & U.S. Nat. Herb.); damp soil in thicket, mountain road to Morne Rochelois, Miragoane and vicinity, Sept. 9, 1927, *W.J.Eyerdam 497* (Gray Herb., U.S. Nat. Herb. & Herb. N.Y. Bot. Gard.).

SANTO DOMINGO: Barahona, in feuchten Bergwaldrungen, Bl. weiss, 850 meters alt., Sept. 1910, *Peter Fuertes 507* (Herb. Ames).

PUERTO RICO: Sierrade Sares in sylva prim. ad Guajataca *rara*, February 16, 1887, *P.Sintenis 6237* (U.S. Nat. Herb.); prope Ulluado in sylva prim. ad Cayuro, March 9, 1887, *P.Sintenis 6367* (U.S. Nat. Herb.).

Corymborchis cubensis usually occurs at much lower altitudes than *C.flava*. Both species are very similar in habit, being about the same height, and with coarse reed-like terete stems which are leafy above. *Corymborchis cubensis* has a grayish, usually lepidote peduncle; whereas *C.flava* has a smooth, reddish, glossy peduncle. The ultimate branches of the inflorescence of *C.cubensis* are usually more in number than in *C.flava*, and are conspicuously arcuate-descending; whereas those of *C.flava* are fewer in number and are usually suberect or ascending. The flowers of *C.cubensis* are comparatively thin and delicate in contrast to the leathery and fleshy flowers of *C.flava*.

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PLANTAE MEXICANAE IV

BY

RICHARD EVANS SCHULTES

NOTES ON THE HISTORY AND DISTRIBUTION OF RHODOCHITON VOLUBILE

Rhodochiton volubile Zuccarini ex Otto & Dietrich has interested horticulturists ever since its discovery more than one hundred years ago. It represents a monotypic genus of the *Scrophulariaceae*, very close to *Lophospermum*, to which it has twice been assigned in the past; at the present time, *Rhodochiton* is maintained as distinct. This genus is endemic to Oaxaca, and it is probable that all of the collections are from the mountainous portions of the northeasternmost part of that state. The seeds which produced the type plant were collected somewhere in Mexico by Baron Karwinski; the fact that Karwinski collected in the mountains, where *Rhodochiton* has since been found, is offered as evidence that the place of origin of the species was northeastern Oaxaca. The native habitat of the plant is in the dark, dense, cool rain-forests at very high altitudes.

Rhodochiton volubile *Zuccarini ex Otto & Dietrich* in Verh. Ver. Gart. Preuss. 10 (1829?) 152, t. 1—Zuccarini in Abh. Akad. Muench. 1 (1832) 306, *in synon.*

Lophospermum atro-sanguineum Zuccarini in Abh. Akad. Muench. 1 (1832) 306.

Lophospermum Rhodochiton D. Don in Sweet Brit. Fl. Gard. n.s., 3 (1834) t. 250.

Zuccarini, who first grew this plant from seed in Europe, originally believed that it represented a new genus, and he sent out seeds of it under the unpublished name "*Rhodochiton volubile.*" Referring to this use of the name, Zuccarini later wrote (1): "Ich hielt sie anfangs, die Dons Gattungscharacter in einigen Dingen abweicht, für ein neues Genus und versendete die im Sommer 1829 gewonnenen Samen unter dem Namen *Rhodochiton volubile* an mehrerer Gärten."

With the seeds, he sent out a description of the plant to Otto and Dietrich who shortly thereafter published the name *Rhodochiton volubile*, together with the description which Zuccarini had communicated to them.

In 1832, Zuccarini (1) altered his opinion concerning the generic status of the plant and published a description of it under the name *Lophospermum atro-sanguineum*, apparently unaware that Otto and Dietrich had already validated the name *Rhodochiton volubile*.

Zuccarini was not alone in believing that *Rhodochiton volubile* represented a species of *Lophospermum*, for D. Don described this plant in 1834 as *Lophospermum Rhodochiton*.

Munz (2), the most recent monographer of the section of the *Scrophulariaceae* to which *Rhodochiton* belongs, maintains *Rhodochiton* as a monotypic genus.

FIELD COLLECTIONS OF RHODOCHITON VOLUBILE:

MEXICO: Oaxaca, District of Villa Alta, Llano Verde near San Juan Juquila, long. 96° 17′, lat. 17° 10′, July 1839, *H. Galeotti 1069*; District of Villa Alta, San Juan Juquila, long. 96° 17′, lat. 17° 10′, 1839, *Hartweg s.n.*; "Oaxaca", 1894, *Nelson s.n.*; District of Cuicatlán, between San Juan Zautla and Papalo Concepción, long. 96°45′, lat. 17° 52′, June 16-22, 1898, *Conzatti & González 756*; District of Ixtlán, Cerro Malacate, long. 96° 20′, lat. 17° 19′, alt. 2300-2500 m., June 13, 1939, *Schultes 661*.

Rhodochiton volubile represents one of the many local endemics which are found in southern Mexico. It is known chiefly through the many illustrations of it which have appeared in horticultural publications. Very carefully drawn figures are to be found in the Botanical Magazine 61 (1834) t. 3367 and in the Botanical Register 8 (1835) t. 1755.

Herbarium material of this plant is extremely rare. Most of the existing specimens, moreover, represent collections which were made in botanical gardens. Field collections of this species are herbarium rarities. I am aware of only five such collections. Munz (2) cites nine herbarium specimens, representing the eight collections which were available to him for examination. Of these, only two are field collections; the other six were taken from cultivated plants. Munz did not examine and does not refer to the Hartweg material which is in the herbarium at Kew and which was cited by Hemsley in Godman & Salvin Biol. Centr.-Am. 2 (1882) 442, nor to the Galeotti material which was cited by Martens and Galeotti in Bull. Acad. Roy. Bruxelles 12, No. 7 (1845) 3.

The collections represented by: *Hartweg s.n.*, *Galeotti 1069*, *Conzatti & González 756* and *Schultes 661* are from the mountains of the northeastern portion of the State of Oaxaca. The Nelson collection, although it is known to be from the State of Oaxaca, lacks information concerning the precise locality where it was made. Since Nelson made extensive collections in the northeastern part of Oaxaca in 1894, especially in the mountains of the Districts of Villa Alta and Choapam, there is every reason to believe that his specimen of *Rhodochiton volubile*, preserved in the United States National Herbarium, came from the same part of the state as the other four collections.

The restricted distribution of *Rhodochiton volubile* is

emphasized by the foregoing list of field collections. Since many of the botanists who have worked in northeastern Oaxaca (a poorly mapped region) neglected to supply sufficient information concerning localities, it is sometimes difficult, if not impossible, to determine the precise localities where collections were made, unless one is personally acquainted with the region. As exact localities are of extreme importance, especially in the study of endemics, I have cited all of the known field collections of *Rhodochiton volubile* and have added complete geographical data.

We do not know exactly where in Mexico Baron Karwinski collected the seeds from which the type of *Rhodochiton volubile* was grown. In his description, Zuccarini stated merely that the plant "crescit in imperio mexicano."

Karwinski spent five years in Mexico. Although most of this time was devoted to botanical exploration in Oaxaca, little is known concerning the precise localities which he visited. No comprehensive itinerary of his trip is available. However, two of Karwinski's localities, which Zuccarini cited incidentally, are of interest. In a footnote to an article (3) on the *Cactaceae* collected in Mexico by Karwinski, Zuccarini stated that Karwinski had worked "bei San Pedro Nolasco" and "bei Yavesía in der Prov. Oaxaca." Both of these localities are very near the places where the Hartweg, Galeotti, and Schultes collections were made. San Pedro Nolasco is a mountain near the boundary between the Districts of Ixtlán and Villa Alta, while Santa Maria Yavesía (long. 96° 25′, lat. 17° 14′) is a small Indian village in the easternmost part of the District of Ixtlán.

Inasmuch as *Rhodochiton volubile* appears to be endemic to northeastern Oaxaca and since Karwinski is known to have explored the very forests where this spe-

cies grows, are we not justified in assuming that the seeds which produced the type plant were collected in Oaxaca, most probably on the high, rain-forested peaks of the northeastern mountain chains of that state?

Since no adequate description of *Rhodochiton volubile* in the wild state has ever been published, the following notes may be of interest. My collection of this species was made in the dense, cool and luxuriant rain-forest of Cerro Malacate at an altitude of 2300 to 2500 meters. The plant is a luxuriant vine which twines on the foliage of shrubs and low trees in the deeper parts of the forest where little direct sunlight penetrates.[1] It presents a very beautiful and striking appearance. The deep purple corollas and reddish calyces of the flowers are very noticeable against the dark green of the forest shrubbery, and together with the brilliant vermillion flowers of *Epidendrum vitellinum* Lindley, constitute the most conspicuous feature in the dense shade of the forests of Cerro Malacate. Nowhere in the mountains of northeastern Oaxaca, however, is *Rhodochiton volubile* abundant. Although I searched for it carefully in other supposedly favorable localities in the Districts of Ixtlán, Cuicatlán and Teotitlán, I did not find it except on Cerro Malacate, and even there it was restricted to a very limited altitudinal range of two hundred meters.

LITERATURE CITED

1. Zuccarini, J.G.: in Abh. Akad. Muenchen 1 (1832) 306.
2. Munz, P.A.: *The Antirrhinoideae-Antirrhineae of the New World*, in Proc. Calif. Acad. Sci. ser. 4, 15 (1926) 396.
3. Zuccarini, J.G.: in Abh. Akad. Muenchen 3 (1837) 12.

[1] In this connection, it is interesting to note that Lindley (in Edwards' Bot. Reg. 8 (1835) t. 1755) very early pointed out to horticulturists in England that the plant's "greatest enemy seems to be bright sunlight."

PLANTAE MEXICANAE V

BY

RICHARD EVANS SCHULTES

DESMONCUS CHINANTLENSIS AND ITS UTILIZATION IN NATIVE BASKETRY

THE DISCOVERY of the use of *Desmoncus chinantlensis* Liebmann ex Martius in the manufacture of baskets among the Chinantec Indians of Oaxaca has prompted me to make a study of the literature for comparative information from other regions.

Although considerable interest in basketry and weaving has been manifest in recent anthropological researches, I have been unable to find in anthropological literature any references to the use of this palm in weaving. There are, however, several scattered and incidental references to this use in technical taxonomic papers.

In view of the importance of *Desmoncus* as an excellent material in basket-making and because of the lack of easily available information regarding its use, it has seemed advisable to present the following notes on the plant and its utilization.

I. BOTANICAL CONSIDERATIONS

Desmoncus chinantlensis *Liebmann* in Overs. Dansk. Vid. Selsk. Forh. 1845 (1846) 8, *nomen nudum*—Liebmann ex Martius Hist. Nat. Palm. 3 (1850) 321.

Attitara chinantlensis (Liebmann) O. Kuntze Rev. Gen. Pl. 2 (1891) 727.

MEXICO: Oaxaca, District of Choapam, San Juan Lacova, long. 95° 55′, lat. 17° 29′, June 1842, *Liebmann 6594* (COTYPE); same locality and date, *Liebmann 6595* (TYPE); same locality and date, *Liebmann 6596* (COTYPE).

Chinantec name: *huan-ka.*

Spanish names: *ballí*; *bejuco de canastos*; *junco*; *junco de jaguay*; *metambilla*.

Zapotec name: *ba-ga-a*.

Desmoncus chinantlensis is a tall, stout-stemmed, subscandent shrub which is characteristically armed on the sheathing petioles with large, strong spines. The leaf blades are pinnate; the pinnae, elongate-elliptic.

The only representative of the genus in Mexico, *Desmoncus chinantlensis* is a very localized endemic, occurring in the District of Choapam (the so-called "Chinantla") of northeastern Oaxaca (where Liebmann collected the type material in 1842) and possibly in the adjacent portion of Vera Cruz. One sterile collection (*H. Ross 1122*) from the isthmus region of Vera Cruz has been referred to *D. chinantlensis* by Burret (Fedde Repert. 36 (1934) 201). Standley (Contrib. U.S. Nat. Herb. 23 (1920) 84) has stated that plants of this genus are said to occur in Tabasco; while *Desmoncus* is to be expected in Tabasco, I have not been able to find any collection of it from that state.

Desmoncus chinantlensis is very abundant in the rainforests on the Atlantic slopes of the mountains of the District of Choapam. It is one of the most conspicuous of the several genera of low palms (*Bactris*, *Chamaedorea*, *Eleutheropetalum*, *Geonoma*, *Hexapetion*, *Reinhardtia*, etc.) which are well developed in the forests of this region.

In 1933, Bailey (Gentes Herb. 3 (1933) 89-92) concluded that a collection of *Desmoncus* from Barro Colorado Island, Panama, which had been identified as *D. polyacanthos* Martius, was "probably *D. chinantlensis*." He pointed out that the Panamanian material matched the type collection of *D. chinantlensis* very closely. Stating that no illustration of *Desmoncus chinantlensis* was

available, he published a drawing of the leaf of the specimen from Panama (fig. 71, on p. 91).

If Bailey's tentative identification be correct, it is evident that *Desmoncus chinantlensis* represents not an endemic, but rather a very wide-ranging and variable species. At the present time, however, most authorities are of the opinion that *Desmoncus* is made up of a number of very localized endemic species. In this respect, *Desmoncus* appears to agree with several of the related genera of palms which are noteworthy because of the large number of endemic species which they contain. The genus *Desmoncus* contains about fifty known species at the present time.

In this connection, Bartlett wrote in his *Certain Desmonci (Palmae) of Central America and Mexico* (Journ. Wash. Acad. Sci. 25 (1935) 81-82): "It appears that the species of *Desmoncus* are in reality rather local in distribution. . . . Either there are many local species with rather slight distinctions, as the writer believes, or else there is a very wide-spread species, *Desmoncus chinantlensis* Liebm., made up of a group of varieties, or (as some botanists might even conclude) of taxonomically negligible variations." Bartlett was of the opinion that Bailey's Panamanian material did not represent *D. chinantlensis*.

In identifying his Panamanian material of *Desmoncus*, Bailey (l.c.) discovered that there were apparent discrepancies between the type of *D. chinantlensis (Liebmann 6595)* at Copenhagen and the two collections *(Liebmann 6594* and *6596)* in the United States National Herbarium. Inasmuch as difficulty has been experienced in identifying specimens of *Desmoncus* because of the uncertainty which these discrepancies have caused, Bartlett (l.c.) designated the two Liebmann collections in the United States National Herbarium as cotypes.

Fortunately, an excellent set of drawings of *Desmoncus chinantlensis* is now available for systematic study. Liebmann skilfully executed a number of drawings of his Mexican palms. These have never been published and, until recently, have been unavailable to most investigators. Through the courtesy of the Field Museum of Natural History, photographic copies of a number of the drawings from Liebmann's *Icones Ined.* have been distributed to several herbaria. The excellence and completeness of the figures of *D. chinantlensis* should remove every difficulty which may arise in the future as a result of ambiguity in the interpretation of the original description or of discrepancies between the three original collections.

II. Utilization

The manufacture of baskets, trays, hampers and other containers of excellent quality is an important industry among the forest-dwelling Chinantec Indians of the "Chinantla." The principal seats of this craft are the mountain villages of San Juan Lacova (long. 95° 55′, lat. 17° 29′), San Juan Petlapa (long. 96° 03′, lat. 17° 29′), San Juan Teotalcingo (long. 95° 58′, lat. 17° 58′), and San Juan Toabela (long. 96° 04′, lat. 17° 32′). In these remote villages, most of the men are skilled in basket-making.

This industry is ancient and is said to be much less extensive among the Chinantecs now than it was formerly. According to Bevan (*The Chinantec: Report on the central and south-eastern Chinantec region. Vol. 1—The Chinantec and their habitat*, Inst. Panam. Geogr. Hist., Publ. 24 (1938) 45), the name of the very ancient Chinantec village of San Juan Lacova is a Zapotec word meaning "place of baskets" or "place of vines."

Most of the baskets, trays and hampers are used local-

ly in the Chinantec villages. The surplus is taken to the Zapotec town of Santiago Choapam (long. 95° 54′, lat. 17° 22′) and is there sold to Zapotec tradesmen for very small sums. The Zapotecs take the baskets to nearby villages and sell them at much higher prices. Apparently none of the excellent Chinantec basketry reaches the markets of Oaxaca City. The baskets which are sold in the capital are made by the Mixtecs of western Oaxaca and are constructed of entirely different plant materials.

The basic plant in this forest Chinantec industry is *Desmoncus chinantlensis*. The men gather the flexuous stems of the palm, remove the sheathing spiny petioles and bark, and use the lustrous white stems without further treatment. One of the Chinantec names of the plant, *huan-ka*, means, according to the natives, "basket *(ka)* vine *(huan)*."

While most of the baskets are made from *Desmoncus chinantlensis*, other plants may enter into their construction. The fibrous aerial roots of epiphytic species of *Anthurium* and *Philodendron*, which are very abundant in the forests of the District of Choapam, are also utilized. Usually only portions of the baskets, especially the covers, are made from the *Anthurium* and *Philodendron* roots, while the main part is constructed of *Desmoncus* stems. Sometimes, however, baskets are made entirely of *Anthurium* or *Philodendron* roots, but these baskets are not so strong and durable as those which are entirely or partly made of *Desmoncus* stems.

According to Bevan (l.c., p. 45), the Chinantec baskets are constructed from the "vine from which are made the splendid hammock-bridges so characteristic of the Chinantec." Many different lianas enter into the construction of the long and beautiful suspension-bridges which are so numerous in northeastern Oaxaca. The most common materials which are used for this purpose I

found to be the stems of some species of *Cissus*, *Entada* and *Vitis* and the elastic aerial roots of some species of *Ficus*. These four plants are not used in Chinantec basketry.

In the Collection of Economic Plants of the Botanical Museum of Harvard University, there are three Chinantec baskets which were collected in San Juan Teotalcingo in June 1939. Two of these are constructed of *Desmoncus chinantlensis* and are exceedingly strong; the third is made almost entirely of the aerial roots of *Philodendron sagittifolium* Liebmann, but with a framework of *Desmoncus chinantlensis*.

In British Honduras, according to Bartlett (l.c., p. 82), the following species of *Desmoncus* (very closely allied to *D. chinantlensis*) are used in making baskets: *D. anomalus* Bartlett, *D. ferox* Bartlett, *D. Lundellii* Bartlett, *D. quasillanus* Bartlett and *D. uaxactunensis* Bartlett. In this connection, he writes: "These related plants of northern Central America are called 'basket tie-tie' or 'basket-whist' by the inhabitants of British Honduras, and 'bayal' by the Spanish-speaking people and the Maya. In British Honduras, any vine is a 'tie-tie' and the *Desmonci* are the particular 'tie-ties' of which baskets are made, whence the name." Similarly, Pittier (*Plantas usuales de Costa Rica* (1908) 114) stated that *matamba* (*D. costaricensis* (Kuntze) Burret)[1] is used in the manufacture of baskets in Nicoya.

In South America, *Desmoncus horridus* Splitgerber ex Martius is used in basketry in Venezuela (Pittier: *Manual de las plantas usuales de Venezuela* (1926) 100-101).

[1] Pittier reported *matamba* as *Desmoncus oxyacanthos* Martius, but, according to Standley (Field Mus. Nat. Hist. Bot. Ser. 18 (1937) 117), this plant is *D. costaricensis*, an endemic of Costa Rica. Standley likewise notes the use of this plant is basket-making in Nicoya.

Pittier quotes Ernst as saying that the stems of this plant are the best and most durable of all cordage materials. In his list of fibre plants of the World (U.S. Dept. Agric. Fiber Invest. Rept. 9 (1899) 149), Dodge makes no mention of the use of *Desmoncus* in basketry, but he reports that the Brazilian *D. macroacanthos* Martius is the source of a useful fiber.

ORCHID STUDIES, XII

BY

LOUIS O. WILLIAMS

THE PRESENT number of the Orchid Studies is a collection of short generic observations which have been made during the past two years. Four subtitles make up the number, as follows: 1. Restrepia *Humboldt, Bonpland & Kunth*, a consideration of generic validity. 2. Nageliella, a new name for the orchidaceous genus Hartwegia *Lindley*. 3. The orchid genera Coelia *Lindley* and Bothriochilus *Lemaire*. 4. A new genus of the Orchidaceae from Central America.

1. RESTREPIA *Humboldt, Bonpland & Kunth*,
A CONSIDERATION OF GENERIC VALIDITY

The genus *Restrepia*, a member of that complex group of genera, the *Pleurothallideae*, recently came under observation when an attempt was made to write a generic description of it that would exclude all known variations of *Pleurothallis*.

Restrepia was first described by Humboldt, Bonpland and Kunth to contain an Andean plant for which they gave an admirable illustration. From that time (1818) to the present the genus ordinarily has been accepted without question; except by that master of generic definition George Bentham who apparently had some misgivings about the validity of the genus (cf. Journ. Linn. Soc. Bot. 22 (1881) 292), although he retained it in the Genera Plantarum.

Species have been added to *Restrepia* by nearly all orchidologists who have worked with American Orchids: Lindley, Reichenbach filius, Rolfe, Schlechter and Ames & Schweinfurth.

The genus *Restrepia*, so far as I am able to determine, has but one character which would entitle it to generic rank and that is the fact that all Restrepias have four pollinia instead of two. However, this character may be used only if all of the species of *Pleurothallis* having four pollinia are removed from that genus. Schlechter has proposed the genus *Barbosella* for some of the species having four pollinia. This proposition, however, does not settle the matter, because there are other species of *Pleurothallis* which are known to have four pollinia and yet cannot be placed in *Restrepia* or *Barbosella* as these genera are currently restricted. An example is the anomalous *Pleurothallis ophiocephala* Lindl. If we allow it to remain in *Pleurothallis*, where it seems to belong, then we must admit the genus *Pleurothallis* as having either two or four pollinia. If it is excluded from *Pleurothallis*, it would seem to constitute a genus of its own. To admit *Pleurothallis ophiocephala* to generic rank would obligate one to admit other such variations to the same rank and hence cause unwarranted generic segregation among the *Pleurothallideae*.

Barbosella Schlechter, as delimited by him, is a closely allied group of species having four pollinia. The group is very closely allied to the Restrepias of traditional usage, from which it differs only in the fact that the dorsal sepal and the petals do not have clavellate apices. Ames and Schweinfurth have taken most of the valid species of *Barbosella*, which were not originally described as *Pleurothallis*, and have transferred them to that genus. In making these transfers they did not mention that *Barbosella* is more closely allied to *Restrepia*, which they maintained, than it is to *Pleurothallis*. While I agree that *Barbosella* should be placed in *Pleurothallis*, I would not agree to this reduction if *Restrepia* were to be retained. By permitting the species described as *Barbosella* to re-

main in *Pleurothallis*, we must characterize *Pleurothallis* as having either two or four pollinia.

In *Restrepia*, then, we find that the main generic character (the four pollinia) used to segregate it, is duplicated in *Pleurothallis*.

One other character for segregation of *Restrepia* remains, the curious clavellate or antenna-like apices of the petals and sometimes of the dorsal sepal. This character is quite clear in some species, while in others it is all too vague. Even were this character always observable, and even if hints of it were not present in those species which were segregated as *Barbosella*, I should not be inclined to consider of generic rank plants exhibiting this character when not accompanied by other significant characters.

It would doubtless be of value to retain the name *Restrepia* for a section of *Pleurothallis* for those plants which exhibit clavellate sepals and petals as this character usually gives a rather distinctive appearance to the plants.

PLEUROTHALLIS *R. Brown* section **Restrepia** *(HBK.) L. O. Williams comb. nov.*

Restrepia Humboldt, Bonpland & Kunth Nov. Gen. & Sp. 1 (1816) 366, t. 94.

In Mexico and Central America,—in addition to *Pleurothallis muscifera* Lindl. (*Restrepia muscifera* (Lindl.) Reichb. f.), *Pleurothallis pilosissima* Schltr. (*Restrepia pilosissima* Ames & Schweinf.) and perhaps one or two others,—there are the following species, formerly referred to *Restrepia*, which should be transferred to this section of *Pleurothallis*.

Pleurothallis Amesiana *L. O. Williams nom. nov.*

Restrepia Lankesteri Ames & Schweinfurth in Sched. Orch. 10 (1930) 20, non *Pleurothallis Lankesteri* Rolfe.

Pleurothallis Dayana *(Reichb.f.) L.O. Williams comb. nov.*

Restrepia Dayana Reichenbach filius in Gard. Chron. n.s. 4 (1875) 257.

Pleurothallis filamentosa *(A. & S.) L.O. Williams comb. nov.*

Restrepia filamentosa Ames & Schweinfurth in Sched. Orch. 8 (1925) 19, fig. 3.

Pleurothallis subserrata *(Schltr.) L.O. Williams comb. nov.*

Restrepia subserrata Schlechter in Fedde Repert. Beihefte 19 (1923) 291.

Pleurothallis xanthophthalma *(Reichb.f.) L. O. Williams comb. nov.*

Restrepia Lansbergii "Reichb.f." sensu Hooker in Bot. Mag. 87 (1861) t. 5257.

Restrepia xanthophthalma Reichenbach filius in Hamb. Gartenzeit. 21 (1865) 300.

2. Nageliella, a new name for the orchidaceous genus Hartwegia *Lindley.*

NAGELIELLA *L.O. Williams nom. nov.*

Hartwegia Lindley in Bot. Reg. 23 (1837) sub t. 1970, non Nees (1831).

Nageliella purpurea *(Lindl.) L.O. Williams comb. nov.*

Hartwegia purpurea Lindley in Bot. Reg. 23 (1837) sub t. 1970—Reichenbach filius in Saunders Refug. Bot. 2 (1870) t. 94.

Lindley named this monotypic orchid genus for Theodore Hartweg who, somewhat more than a century ago,

was one of the most enthusiastic collectors of Mexican orchids. Due to the fact that Lindley's name is a homonym of the earlier *Hartwegia* Nees, it is necessary to give the genus a new name.

To carry out Lindley's idea of honoring a collector especially interested in Mexican Orchidaceae, I take this opportunity of renaming the genus for Mr. Otto Nagel. Mr. Nagel, collecting in Mexico just one century after Hartweg, has probably collected more species and specimens of Mexican orchids and travelled more widely over Mexico than any other collector who has ever been in that delightful country.

Nageliella is a monotypic genus. Two other species which were described under *Hartwegia* Lindl. appear to belong elsewhere.

Dr. R. Mansfeld (Notizbl. Bot. Gart. Berlin 13 (1938) 667) has indicated that he thought that *Hartwegia* should be referred to the subtribe *Laeliinae (Laelieae)* rather than to the *Ponerinae (Pontereae)*. The two subtribes stand very close to one another, and it is sometimes difficult to distinguish them; but it seems best to retain *Nageliella* in the *Pontereae*, since I find a distinct column-foot in *Nageliella* which is never found in the genera of the *Laelieae*.

3. The orchid genera Coelia *Lindley* and Bothriochilus *Lemaire*

In 1830, Lindley described the genus *Coelia* in his Genera and Species of Orchidaceous Plants, p. 36, basing it on a drawing made by Bauer. When he received material for study, the characters of the genus were emended (Bot. Reg. 28 (1842) t. 26).

Four additional species have been referred to the genus since its publication. All four of these species are at variance with the original species in a number of char-

acters. The fact that there are several differences has been generally overlooked. However, Lemaire erected the genus *Bothriochilus* to contain one of the species. Hooker noted the differences in some of the species (Bot. Mag. 107 (1882) t. 6628) and suggested that *Coelia* might be divided into two sections, commenting at the same time on Lemaire's genus in the following words: "Bothriochilus is proposed by Lemaire, but it has no characters to stand upon, and indeed it is very probable that plants with intermediate characters will be found uniting the group." Hooker's division of the group was entirely superficial and overlooked the more stable characters which are present.

Bentham and Hooker in the Genera Plantarum so described *Coelia* that the characters of no plant which I know will fit it. Part of the characters attributed to it were derived from *Coelia triptera* and part of them from *C. macrostachya* and *C. bella*, but in such a way as to make them inapplicable to the component species of the genus. Two examples of this will suffice. The lateral sepals are described, in part, as follows: ". . . basi cum pede columnae in mentum breve v. elongatum connata.", which does not apply at all to *Coelia triptera*, the type species. The column is described, in part, as follows: "Columna brevis, latiuscula . . . .", which applies to *Coelia triptera* but to no other species.

Attention should be called to the fact that the resemblance of the species which have been referred to *Coelia* is very close. There seem to be no vegetative characters which would assist in separating them generically.

A tabulation of characters which are available for generic segregation may be useful and is given here. I believe that these characters are sufficient to necessitate the recognition of two genera.

COELIA	BOTHRIOCHILUS
(C. triptera)	*(B. macrostachyus, B. bellus* and *B. guatemalensis)*
Column-foot lacking or nearly so.	Column-foot subequal to the column in length.
Column very short and broad.	Column long and slender.
Lateral sepals not forming a mentum.	Lateral sepals forming a distinct mentum.
Lateral sepals not adnate to the column nor to the obscure column foot.	Lateral sepals adnate to the column-foot.
Lip not deflexed, saccate nor otherwise complicated at the apex of the claw.	Lip either sharply deflexed or saccate (one species with a short didymous sac) at the apex of the claw.

These considerations seem to indicate that two genera are present. For those species which are generically distinct from the type species of *Coelia*, I reinstate the genus *Bothriochilus* Lemaire which contains the following species.

1. **Bothriochilus bellus** *Lemaire* in Illustr. Hort. 3 (1856) Misc. p. 30.

Bifrenaria bella Lemaire in Jard. Fleuriste 3 (1853) t. 325.

Coelia bella Reichenbach filius in Walpers Ann. 6 (1861) 218— Hooker in Bot. Mag. 108 (1882) t. 6628.

Coelia picta Bateman ex Hooker in Bot. Mag. 108 (1882) sub t. 6628, *nomen*.

The largest-flowered species of the genus. Known from Guatemala and Honduras.

2. **Bothriochilus guatemalensis** *(Reichb.f.) L. O. Williams comb. nov.*

Coelia guatemalensis Reichenbach filius in Walpers Ann. 6 (1861) 219.

A rare species which is recorded only from Guatemala. The type is said, by Reichenbach, to be in Lindley's herbarium.

3. **Bothriochilus macrostachyus** *(Lindl.) L.O. Williams comb. nov.*

Coelia macrostachya Lindley in Bentham Pl. Hartw. (1842) 92—Hooker in Bot. Mag. 79 (1853) t. 4712.
Coelia macrostachya Lindl. var. *genuina* Reichenbach filius Beitr. Orch. Centr.-Am. (1866) 41.
Coelia macrostachya Lindl. var. *integrilabia* Reichenbach filius Beitr. Orch. Centr.-Am. (1866) 41.

Bothriochilus macrostachyus is probably the commonest species of the genus. It is known from Mexico, Guatemala, Honduras and Panama.

Dubious species

Coelia densiflora *Rolfe* in Kew. Bull. 1906: 375.

There is no material of this species (which obviously belongs to *Bothriochilus*) available for study in the Ames Herbarium. It is possible that it may be a synonym of *Bothriochilus guatemalensis.*

4. A new genus of the Orchidaceae from Central America.

EPIDANTHUS *L.O. Williams gen. nov.*

(Tribus Kerosphaereae, Serie Acranthae, Subtribus (?) Polystachyeae). Sepala similia, libera, lanceolata, reflexa vel patula. Petala basi callo vel junctione petali et columnae callo ornata. Labellum integrum vel trilobum, basi columnae adnata. Columna brevis, teres, labello vel labelli callo adnata. Rostellum breve, emarginatum; clinandrium alatum. Anthera terminalis, operculata, incumbens, biloculata. Pollinia duo, subglobosa, cerea, stipitata.

Sepals similar, free, lanceolate, reflexed or spreading. Petals with a callus at the base or at the junction of the petal and column. Lip simple or three-lobed, adnate at the base to the column, sometimes surrounding the column. Column short, terete, adnate to the lip or callus of the lip for its entire length; rostellum short, emarginate; clinandrium evenly winged. Anther terminal, operculate, incumbent, two-celled; pollinia two, subglobose, waxy; stipe to each pollinium oblong, free from the other stipe almost to the oblong-ovate gland.—Small simple or branched epiphytic herbs with slender, leafy, repent or caespitose stems, lacking pseudobulbs. Leaves distichous, jointed at the base, plane or terete, linear or subfiliform; leaf-sheaths persistent on the stems. Inflorescence a terminal, distichous, fractiflex raceme. Flowers small.—Characteristic species, *Epidanthus paranthicus* (Reichb.f.) L.O.Williams.

If we follow Schlechter's system of classification (Notizbl. Bot. Gart. Berlin 9 (1926) 563–591), *Epidanthus* apparently should be placed as the most advanced member of the tribe *Kerosphaereae*, series *Acranthae*. Whether it should be placed in the subtribe *Polystachyeae*, a group of genera predominantly of Asia and Africa but occurring in the Americas, or whether it should be placed in a new subtribe of its own, I am not sure.

There seem to be no close generic allies. Its relationship to *Epidendrum*, where all of the species have been previously placed, is no more than a superficial resemblance.

The name *Epidanthus* is derived by taking the first part of the name *Epid*endrum and adding to it the word ἄνθος, a flower, in allusion to the Epidendrum-like flowers and the fact that all of the species previously have been placed in the genus *Epidendrum*.

Lip 3-lobed or 3-lobulate.

Petals lanceolate-oblong to ovate-oblong; lateral lobes of the lip transversely and obliquely oval or triangular-oval; base of the lip cordate 1. *E. paranthicus*

Petals narrowly linear or elliptic-linear; lateral lobes of the lip semiorbicular; base of the lip rounded or cuneate 3. *E. muscicola*

Lip simple, obscurely lobulate or bilobed.

Base of the petals auriculate; lip narrowly lanceolate-triangular, acuminate 2. *E. goniorhachis*

Base of the petals not auriculate; lip not narrowly lanceolate-triangular, commonly abruptly acuminate to rostrate 1. *E. paranthicus*

1. **Epidanthus paranthicus** *(Reichb.f.) L. O. Williams comb. nov.*

Epidendrum paranthicum Reichenbach filius in Bot. Zeit. 10 (1852) 732—Ames, Hubbard & Schweinfurth Genus Epidendrum in U.S. & Middle America (1936) 145.

Epidendrum Sancti Ramoni Kränzlin in Vierteljahrsschr. Naturforsch. Gesell. Zürich 74 (1929) 137.

Range: Mexico, Guatemala, Honduras, Costa Rica and Panama.

Mexico: *Nagel & Monzón 6736, 7146.*

Guatemala: *Johnson 557; Liebmann s.n.; Tuerckheim 927, 1915.*

Honduras: *Edwards 165.*

Costa Rica: *Brade 1312; Brenes 534, 542; Lankester 383, 386; Pittier 2008; Standley 33916, 38560, 39484, 39503, 39570b, 39591; Standley & Torres 47748, 47761, 47986; Standley & Valerio 48348, 50364, 50791, 50824, 52377; Stork 2209; Tonduz 17617; Valerio 52.*

Panama: *Davidson 121.*

2. **Epidanthus goniorhachis** *(Schltr.) L. O. Williams comb. nov.*

Epidendrum goniorhachis Schlechter in Beihefte Bot. Centralbl. 36, Abt. 2 (1918) 462—Ames, Hubbard & Schweinfurth Genus Epidendrum in U.S. & Middle America (1936) 104.

Epidendrum fractiflexum Lehmann & Kränzlin in Engl. Bot. Jahrb. 26 (1899) 468, non Rodrigues (1881).
Range: Costa Rica.

Costa Rica: *Brenes 84; Lankester 1019; Lehmann 1077; Smith H584; Standley 51299, 51323.*

3. **Epidanthus muscicola** *(Schltr.) L.O. Williams comb. nov.*

Epidendrum muscicola Schlechter in Fedde Repert. Beihefte 19 (1923) 214, (as "muscicolum")—Ames, Hubbard & Schweinfurth Genus Epidendrum in U.S. & Middle America (1936) 126.
Epidendrum linifolium Ames in Sched. Orch. 7 (1924) 7, t. 20.
Range: Costa Rica.

Costa Rica: *Brenes 44, 16201; Jimenez 2015; Skutch 3377; Smith H1137, H1314; Stork 417, 1606, 3290; Standley 32967, 38255, 38317, 38326.*

A NEW VARIETY OF EPIDENDRUM FROM COSTA RICA

BY

LOUIS O. WILLIAMS

Epidendrum (§ Euepidendrum) **equitantifolium** *Ames* var. **aporophyllum** *L. O. Williams var. nov.*

A specie foliis brevioribus et latioribus differt; pedunculi elongati, foliorum apicem multo excedentes, ala minore; labellum liberum fere ad columnae basim; columna apice non abrupte decurvata.

The variety differs from the species in having the leaves much shorter and comparatively broader with the angle of divergence seemingly greater; in having the pedunceles much elongated and extending well above the apices of the subtending leaves and in having the wing of the pedunele less prominent. Furthermore, the pedunele of the variety does not simulate a leaf as does that of the species, and the lip is free from the column nearly to the base, *not* adnate nearly to the stigma. The apex of the column is not sharply decurved as it is in the species.

COSTA RICA: a fairly common orchid of hedgerows or exposed trees in pasture, Las Cóncavas, flowers pinkish, October 1928, *Lankester 1221* (TYPE in Herb. Ames No. 35080).

The following Costa Rican specimens, cited by collector and number, also belong here:

Brenes 606; Lankester s.n., 757, 959; Standley 33778, 33798, 33893, 35835; Standley & Torres 51681, 51760; Standley & Valerio 47206.

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NOTES ON A COLLECTION OF PLANTS FROM THE HOPI INDIAN REGION OF ARIZONA MADE BY J.G.OWENS IN 1891

BY

PAUL A. VESTAL

RECENTLY, in the Botanical Museum of Harvard University, I came upon a collection of plants made by the Hemenway Expedition in Arizona. There is no indication as to who made the collection or who identified the plants. Exact locations are not mentioned, but Indian names are given as well as the use of the plants.

Upon inquiring at the Peabody Museum[1], it was ascertained that the Indian names are Hopi and that there were several expeditions bearing the name "Hemenway Expedition." For the most part the collections of the Hemenway Expeditions were ethnological and archeological in nature. The principal expeditions financed by Mrs. Mary Hemenway, of which there is material in the Peabody Museum, were made in 1887 and 1888.

In "The Hopi Journal of Alexander M. Stephen," edited by Elsie Clews Parsons (4), it is recorded that "when J. Walter Fewkes began to study the Hopi as director of the Hemenway expedition, in 1890, he en-

[1] I wish to express my sincere thanks to Mr. Donald Scott, Director, Mr. J. O. Brew and Associate Professor Clyde Kluckhohn of the Peabody Museum of Harvard University for their aid in determining the Indian tribe, obtaining information about the Hemenway Expedition and in suggesting early literature relating to Hopi ethnobotany.

listed Stephen's coöperation." Fewkes, in "A Contribution to Ethnobotany" (1), makes the statement that parts of his material "were collected while at work for the Hemenway expedition and portions as special ethnologist of the Smithsonian Institution." Furthermore, he states that his specimens were identified "by the late Dr. Sereno Watson, of Harvard University, and have been deposited in the herbarium of that institution." He also refers to an accumulation of material on the foods and food reserves of the Hopi Indians, begun in 1891 by a student, "the late J. G. Owens," upon which he has a memoir in preparation. This article he states as being "more or less preliminary in nature."

Later, in the summers of 1896 and 1897, Walter Hough spent some time in the Hopi region in company with Dr. J. Walter Fewkes, making a study of the ethnobotany of the Hopi Indians. The specimens of plants collected, according to the reports of Hough (2), (3), are to be found in the United States National Museum.

There are a few bits of newspapers that were found in the collection of plants under consideration. These newspapers were apparently used as driers because they have written on them a field number and the Indian name of the plant. They bear the name and the date of the "Boston Weekly Post," Friday, May 22, 1891, and the "Philadelphia Press," Saturday, May 23, 1891. There is also a strip from some New York paper with the date May 23, 1891. It seems reasonable to infer, therefore, that the collection was made during the summer of 1891 or later. During the summer of 1891, Fewkes, Owens and Stephen, according to the written reports, were working in the Hopi area.

In checking this collection of plants with specimens in the Gray Herbarium of Harvard University, a number of specimens collected by J. G. Owens in 1891 were

found. However, these plants in the Gray Herbarium did not give the Indian names nor the uses, although some of the species were identical with those in the collection under consideration. Later, in comparing certain loose specimens in this collection with the mounted specimens in the Gray Herbarium, labels with the following information were found:

Indian Food Plants
Hemenway Expedition to Hopi Country,
N. E. Arizona, 1891.
Coll. John G. Owens

In addition to the above typewritten label, there is a small handwritten label which in writing and wording appears to be exactly like the label found with the loose material in the collection of plants under consideration. A further comparison of the labels on certain specimens in the Gray Herbarium indicates that the writing on these labels is similar to, if not identical with, that on all the labels for the collection here treated. There seems to be little doubt that the collection now under discussion is part of the J. G. Owens collection of Hopi foods and food reserves made in 1891 which is referred to by Fewkes and upon which he was preparing a memoir.

In comparing the collection in hand with the published report of Fewkes (1), it was found that many of these species were reported by him. However, of the forty-four plant specimens in this collection which are reported by Fewkes, thirty-one of them have a use which is slightly or entirely different from that given by him. It was also discovered that in this group of plants all but six of the Hopi names recorded for them were slightly different in spelling from those recorded by Fewkes. These differences in use and the variations in the Hopi names suggest that all of the present collection was not used by Fewkes in the preparation of his article.

A similar comparison was made with the published material of Hough (2), (3). In this case there were thirty-three plants mentioned by Hough which are in the collection under discussion. Seventeen of these have a different use. Only six plants appear in this collection which are mentioned in Stephen's Journal (4). There is only one with a different recorded use.

There is now available an excellent and unusually complete "Ethnobotany of the Hopi" by Whiting (5), which may be very useful in comparing the present with the past uses of the same plants by members of this tribe. When the collection under discussion was subjected to this comparison, it was found that for the most part the uses agree. There are only four discrepancies. It was found that *Coriandrum sativum* L. (introduced), *Castilleja linariaefolia* Benth. and *Artemisia frigida* Willd. were formerly used as food or food adjunets, and *Suaeda fruticosa* (L.) Forskal was formerly applied in a different manner as a medicine. This would seem to be indicative of a relatively stable knowledge of plant use over the past fifty years. However, the collection under discussion contains fifteen plant species not mentioned by Whiting, twelve of which were used as food and three as medicine. Does this mean that acculturation factors as well as a decreasing dependence upon agriculture have brought about an abandonment of certain natural resources previously exploited? It would seem that this may be true. However, this transformation may have been caused in part by a modified flora resulting from overgrazing and soil erosion. In addition to the facts just noted, the collection under consideration contains information concerning plants which were not found by Whiting, but which were referred to by the earlier workers.

Because of the difference in the recorded uses of the plants collected by Owens from the uses of the same

plants which have been published by other workers (1), (2), (3), (4), (5), the writer presents the information embodied in the collection as a record of one of the early collections of plants from the Hopi region. The information not only broadens our knowledge of the uses of the plants by the Hopi in the 1890's, but it also gives more comparative material for present and future workers interested in the ethnology and ethnobotany of these Indians.

The Owens collection of plants under discussion in this paper is now deposited in the Herbarium of Economic Botany, Botanical Museum, Harvard University. The material has been re-identified and the present accepted names used. The enumeration of the material has been arranged in systematic order and wherever possible a common name has been given. In all cases, the authority for the botanical names is cited in full. In instances of double citation, the name-bringing synonym has been given. Synonomy is used where there has been a nomenclatorial change. When the original determination of a plant has been found in error, the original identifications are given in parenthesis. The Hopi names and the uses made of the plants are those of the original collector, J.G.Owens, and are taken directly from the herbarium sheets.

PINACEAE
(Pine Family)

Juniperus utahensis *(Engelmann) Lemmon* in Calif. Board Forest. Rept. 3 (1890) 183.

Juniperus californica Carrière var. *utahensis* Engelmann in Trans. Acad. St. Louis 3 (1877) 588.

Utah Juniper.

(Originally identified as *Juniperus occidentalis*).

Hoi-háq-bi.

"Boil branches and drink the tea. Used especially by women during confinement."

GRAMINEAE
(Grass Family)

Leptoloma cognatum *(Schultes) Chase* in Proc. Biol. Soc. Wash. 19 (1906) 192.

Panicum cognatum Schultes in Roemer & Schultes Syst. Veg. Mant. 2 (1824) 235.

Panicum autumnale Bosc ex Sprengel Syst. Veg. 1 (1825) 320.

Fall Witchgrass.

Bá-du-sha-ka.

"Grind seed into meal."

Muhlenbergia pungens *Thurber* in Asa Gray in Proc. Acad. Nat. Sci. Phila. 1863 (1863) 78.

Purple Hairgrass.

Wúrg-si.

"Used to make brooms."

Muhlenbergia rigens *(Bentham) Hitchcock* in Journ. Wash. Acad. Sci. 23 (1933) 453.

Epicampes rigens Bentham in Journ. Linn. Soc. Bot. 19 (1881) 88.

Deergrass.

Kúath-kui.

"Grind seed and make bread of meal."

Oryzopsis hymenoides *(Roemer and Schultes) Ricker ex Piper* in Contrib. U.S. Nat. Herb. 11 (1906) 109.

Stipa hymenoides Roemer and Schultes Syst. Veg. 2 (1817) 339.

Oryzopsis cuspidata Bentham ex Vasey in U.S. Dept. Agric. Spec. Rept. 63 (1883) 23.

Sand Bunchgrass, Indian Ricegrass, Indian Millet.
Lé-huh.

"Grind the seed and make a meal of it."

Panicum capillare *Linnaeus* Sp. Pl. 1 (1753) 58.
Witchgrass.
Né-ni.

"Grind seed and make bread of meal."

CYPERACEAE
(Sedge Family)

Scirpus validus *Vahl* Enum. Pl. 2 (1806) 268.
Scirpus lacustris auth. Amer., non Linnaeus.
Great Bulrush.
Ma-múz-ri.
"Eat raw the lower end of the stalk."

LILIACEAE
(Lily Family)

Allium vineale *Linnaeus* Sp. Pl. 1 (1753) 299.
Field Garlic (introduced from Europe).
Á-so-si.

"Use the bulb."

Calochortus aureus *S. Watson* in Amer. Nat. 7 (1873) 303.
Mariposa Lily.
Ḿe-e-si.

"Eat flowers, also the bulb."

POLYGONACEAE
(Buckwheat Family)

Eriogonum corymbosum *Bentham* in deCandolle Prodr. 14 (1856) 17.

Bo-wá-wi.

"Boil and press the stalks into cakes. When these dry they eat them with salt."

Eriogonum Hookeri *S. Watson* in Proc. Amer. Acad. 14 (1879) 295.

Kál-naq-a-buq.

"Boil with mush for its flavor."

CHENOPODIACEAE
(Goosefoot Family)

Atriplex argentea *Nuttall* Gen. Pl. 1 (1818) 198.

Saltbush.

Ung-át-ki.

"Boil with meat."

Atriplex canescens *(Pursh) Nuttall* Gen. Pl. 1 (1818) 197.

Calligonum canescens Pursh Fl. Amer. Sept. (1814) 370.

Fourwing Saltbush, Shadscale.

Shu-bi.

"Ashes used instead of baking soda."

Atriplex confertifolia *(Torrey) S. Watson* in Proc. Amer. Acad. 9 (1874) 119.

Obione confertifolia Torrey in Fremont Rept. Exped. Rocky Mount. (1845) 318.

Shadscale.

Ho-i-á-vi-ko.

"Boil with meat."

Chenopodium album *Linnaeus* Sp. Pl. 1 (1753) 219.

Lamb's-quarters (introduced from Europe, now widely distributed).

Shís-wa.

"Grind the seed and make a mush."

Chenopodium Fremontii *S. Watson* in King Rept. Geol. Explor. 40th Par. 5 (Bot.) (1871) 287.

Wi-bá-tub-huh.

"Grind the seed and make a mush of it."

Chenopodium leptophyllum *Nuttall ex Watson* in Proc. Amer. Acad. 9 (1874) 94.

Cha-chá-tub-huh.

"Grind the seed and make a mush of it."

Cycloloma atriplicifolium *(Sprengel) Coulter* in Mem. Torr. Bot. Club 5 (1894) 143.

Salsola atriplicifolia Sprengel Bot. Gart. Hal. Nachtr. 1 (1801) 35.

Tumble Weed.

(Originally determined as *Chenopodium cornutum*).

Ko-tók-i.

"Make a mush of the ground seed."

Suaeda fruticosa *(Linneaus) Forskal* Fl. Aegypt.-Arab. (1775) 70.

Chenopodium fruticosum Linnaeus Sp. Pl. 1 (1753) 221.

Suaeda intermedia S. Watson in Proc. Amer. Acad. 14 (1879) 296.

Seepweed.

Chi-ích-de-bi.

"Put the dried leaves on sore places."

Monolepis Nuttalliana *(Schultes) Greene* Fl. Francisc. (1891) 168.

Blitum Nuttallianum Schultes in Roemer & Schultes Syst. Veg. Mant. 1 (1822) 65.

Monolepis chenopodioides Moquin-Tandon in de Candolle Prodr. 13, pt. 2 (1849) 85.

Hu-rú-tub-huh.

"Grind seed and make it into a mush."

Sarcobatus vermiculatus *(Hooker) Torrey* in Emory Milit. Reconn. (1848) 149.

Batis (?) vermiculata Hooker Fl. Bor.-Amer. 2 (1838) 128.

Greasewood.

Dé-bi.

"Make their planting-sticks and poorer boomerangs of this."

AMARANTACEAE
(Amaranth Family)

Amaranthus blitoides *S. Watson* in Proc. Amer. Acad. 12 (1877) 273.

Prostrate Amaranth, Spreading Pigweed.

Bó-ci-û.

"Make a mush from the ground seed."

Amaranthus cruentus *Linnaeus* Syst. Nat. Veg. ed. 10, 2 (1759) 1269.

Amaranthus paniculatus Linnaeus Sp. Pl. ed. 2 (1763) 1406.

Cockscomb (native to Asia).

Ko-mo.

"Flowers used to color bread red for certain dances."

Amaranthus Torreyi *(A. Gray) Bentham* in S. Watson Bot. Calif. 2 (1880) 42.

Amblogyne Torreyi A. Gray in Proc. Amer. Acad. 5 (1861) 167.

Wí-wa.

"Boil with meat."

CRUCIFERAE
(Mustard Family)

Dithyraea Wislizenii *Engelmann* in Wislizenius Mem. Tour North. Mex. (1848) 96.

Biscutella Wislizeni Brewer and Watson Bot. Calif. 1 (1878) 48.

Spectacle-pod.

Kō-chíb-si.

"Ground stalk used as a salve for all kinds of sores."

Stanleya albescens *M. E. Jones* in Zoe 2 (1891) 17.

Ís-heh.

"Boil and eat."

SAXIFRAGACEAE
(Saxifrage Family)

Ribes cereum *Douglas* in Trans. Hort. Soc. Lond. 7 (1830) 512.

Wax Currant.

En-wíb-si.

"Used for pains in the stomach."

LEGUMINOSAE
(Legume, Pulse or Pea Family)

Dalea lanata *Sprengel* Syst. Veg. 3 (1826) 327.

Koí-shung-û.

"Eat the root. Regard it as sugar."

LOASACEAE
(Loasa Family)

Mentzelia albicaulis *Douglas ex Hooker* Fl. Bor.-Amer. 1 (1834) 222.

Sál-li.

"Mash seeds and roll into sticks and eat."

UMBELLIFERAE
(Parsley Family)

Coriandrum sativum *Linnaeus* Sp. Pl. 1 (1753) 256.

Coriander (introduced from southern Europe).

Ku-rán-to.

"Dip in water, eat raw and green."

Foeniculum vulgare *Miller* Gard. Dict. ed. 8 (1768) Foeniculum no. 1.

Fennel (introduced from Europe).

Kuang-ná-pi-ba.

(Use not given).

ASCLEPIADACEAE
(Milkweed Family)

Asclepias galioides *Humboldt, Bonpland & Kunth* Nov. Gen. & Sp. 3 (1818) 188.

(Originally determined as *Asclepias verticillata*).

Bi-íng-uh.

"Used by the mother to produce a flow of milk."

Asclepias speciosa *Torrey* in Ann. Lyc. N. Y. 2 (1827) 218.

Sú-yuh.

"Boil with meat."

BORAGINACEAE
(Borage Family)

Lithospermum linearifolium *Goldie* in Edinburgh Phil. Journ. 6 (1822) 322.

Lithospermum angustifolium Michaux Fl. Bor.-Amer. 1 (1803) 130, non Forskal.

Puccoon, Gromwell.

Pa-láng-û.

"A medicinal plant."

LABIATAE
(Mint Family)

Marrubium vulgare *Linnaeus* Sp. Pl. 1 (1753) 583.

Horehound. (introduced from Eurasia).

Pi-lé-ta-ka.

"Medicinal plant."

Mentha canadensis *Linnaeus* Sp. Pl. 1 (1753) 577.

Common Wild Mint.

Ba-ma-uhg-a-to-sha-bi.

"Boil with mush for its flavor."

Monarda pectinata *Nuttall* in Journ. Acad. Phila. n.s. 1 (1848) 182.

Lemon Monarda, Lemon Mint.

Kā-bĭb-si.

(No use given).

Poliomintha incana *(Torrey) A. Gray* in Proc. Amer. Acad. 8 (1870) 296.

Hedeoma incana Torrey in Emory Rept. U. S. & Mex. Bound. Surv. (Bot.) (1859) 130.

Me-úng-a-to-sha-bi.

"Eat flowers and also boil with certain mush to give it a flavor."

SOLANACEAE
(Nightshade Family)

Lycium pallidum *Miers* in Ann. & Mag. Nat. Hist. ser. 2, 14 (1854) 131 and Illustr. So. Amer. Pl. 2 (1857) 108.

Ke-béb-si.

"Eat the seeds."

Nicotiana attenuata *Torrey ex S. Watson* in King Rept. Geol. Explor. 40th Par. 5 (Bot.) (1871) 276.

Hopi Tobacco.

Pí-bû.

"Very much used."

Solanum Jamesii *Torrey* in Ann. Lyc. N. Y. 2 (1827) 227.

Wild Potato.

Dúm-na

"Small potatoes used principally to make yeast."

SCROPHULARIACEAE
(Figwort Family)

Castilleja linariaefolia *Bentham* in deCandolle Prodr. 10 (1846) 532.

Painted-cup.

Wi-bám-an-si.

"Eat the flowers."

COMPOSITAE
(Thistle Family)

Artemisia dracunculoides *Pursh* Fl. Amer. Sept. (1814) 742.

Shép-eh.

(No use given).

Artemisia frigida *Willdenow* Sp. Pl. 3 (1804) 1838.

Mountain Sagerbrush, Estafiata.

Kúr-ug-yû.

"Put on prayer sticks, also a little put in with sweet corn when they roast it."

Carthamus tinctorius *Linnaeus* Sp. Pl. 1 (1753) 830.

Safflower (introduced from Eurasia).

A-sóp-i-ron.

"Flowers used to color bread yellow for certain dances."

Chrysothamnus Howardii *(Parry ex A. Gray) Greene* in Erythea 3 (1895) 113.

Linosyris Howardi Parry ex A. Gray in Proc. Amer. Acad. 6 (1865) 541.

Bigelovia Howardii A. Gray in Proc. Amer. Acad. 8 (1873) 641.

Rabbit Bush.

Si-wáq-bi.

"Stick in rows in the sand to act as a sandbreak."

Chrysothamnus stenophyllus (*A. Gray*) *Greene* in Erythea 3 (1895) 94.

Bigelovia Douglasii A. Gray var. *stenophylla* A. Gray in Proc. Amer. Acad. 8 (1873) 646.

Rabbit Bush.

Má-i-bi.

"Used as a sand-break to protect young corn and melons."

Gutierrezia sarothrae *(Pursh) Britton & Rusby* in Trans. N. Y. Acad. 7 (1887) 10.

Solidago sarothrae Pursh Fl. Amer. Sept. (1814) 540.

Gutierrezia euthamiae Torrey & Gray Fl. No. Amer. 2 (1842) 193.

Snakeweed.

Bam-na-vi.

"Tied on to the prayer stick."

Lygodesmia grandiflora *(Nuttall) Torrey & Gray* Fl. No. Amer. 2 (1843) 485.

Erythremia grandiflora Nuttall in Trans. Amer. Phil. Soc. n.s. 7 (1841) 445.

Mi-hah.

"Boil with a certain kind of mush for flavor."

Thelesperma gracile *(Torrey) A. Gray* in Hooker Journ. Bot. and Kew Gard. Misc. 1 (1849) 252.

Bidens gracilis Torrey in Ann. Lyc. N. Y. 2 (1828) 215.

Hō-hó-i-si.

"Called coffee, and so used by the Hopi Indians."

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CAMBRIDGE, MASSACHUSETTS, AUGUST 2, 1940 VOL. 8, NO. 9

THE FORMATION OF SEPTA IN THE FIBER-TRACHEIDS OF *Hypericum Androsaemum* L.

BY

PAUL A. VESTAL AND MARY R. VESTAL

ALTHOUGH the presence of nuclei in fibers has been established (9, p. 56), the work of Bailey (6), Goldstein (12), Wareham (16), and Esau (10) suggests that the apparent occurrence of the multinucleate condition in fibers is due to a misinterpretation of the material, except in the phloem. As far as we are aware, no description has been given of a division of the protoplast in a fully developed cell to form a nucleated septate fiber-tracheid.

The definition of a septate fiber-tracheid, now widely accepted, is "A fiber-tracheid with thin, transverse walls across the lumen. (In these elements the protoplast divides after the formation of the secondary wall. The septa are true walls)" (8). This definition recognizes the septate fiber-tracheid as a distinct modification of the fiber-tracheid, which in turn is transitional between a tracheid and a libriform fiber. The presence of nuclei during the early stages of maturation is assumed but not stated.

In an earlier paper (15) it was reported that the fiber-tracheids present in the secondary wood of the genus *Hypericum* are septate or non-septate and typically contain a nucleus. Occasionally the nucleus was seen in

EXPLANATION OF THE ILLUSTRATION

FIGURE 1. Typical nucleus in fiber-tracheid. × ca. 2160.

FIGURE 2. Metaphase division figure in fiber-tracheid. × ca. 2160.

FIGURE 3. Anaphase division figure in fiber-tracheid. × ca. 2160.

FIGURE 4. Telophase division figure in fiber-tracheid. × ca. 2160.

FIGURE 5. Rate telophase division figure in fiber-tracheid. × ca. 2160.

FIGURE 6. Portion of septate fiber-tracheid, showing septum and two nuclei. × ca. 1410.

These drawings were made with an Abbé camera lucida at table level.

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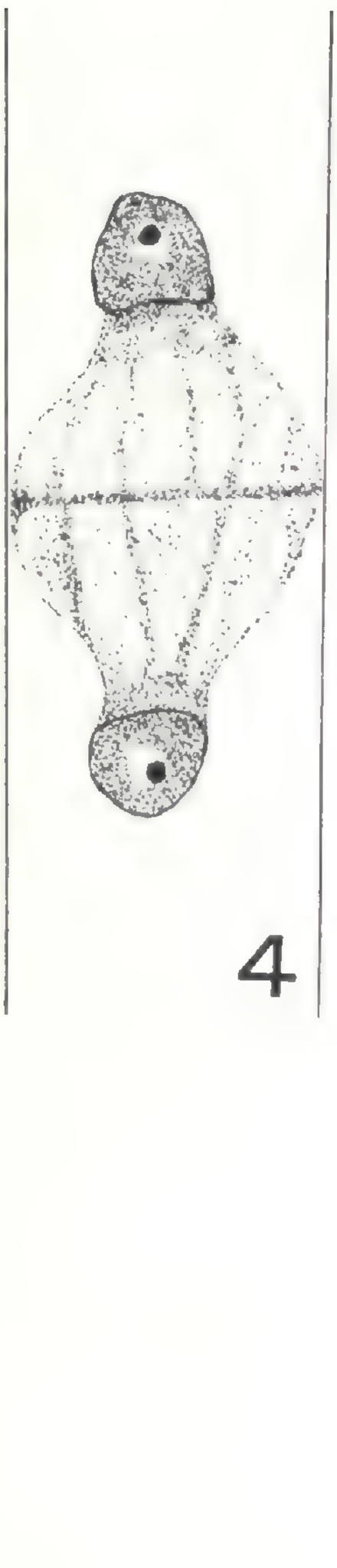

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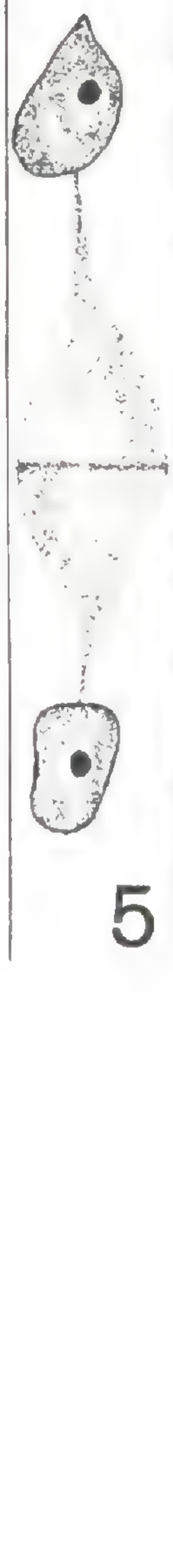

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division (p. 214 and Plate 6, fig. 33). A detailed study of one species, *Hypericum Androsaemum* L., revealed a more complete series of division figures which result in the formation of septa.

In the normal formation of the fiber-tracheid from the cambium the cell undergoes elongation, forms bordered pits, and develops a thick secondary wall. The nucleus of the protoplast, shown in figure 1, is elongate-oval in shape. In general the long axis conforms to the long axis of the fiber-tracheid. Normally there are one or more nucleoli present. Following the normal maturation of the fiber-tracheid in this species, the protoplast remains active. This activity is expressed by the presence of mitotic division figures. Karyokinesis once initiated is followed by cytokinesis. In fixed material, spindle fibers are apparent in metaphase and in early anaphase (figs. 2, 3 and 7) and persist through the telophase (figs. 4 and 8) until the daughter nuclei are distinct. The cell plate is well defined in the telophase just before the daughter nuclei emerge (figs. 4, 5, 8 and 9). It appears to be formed by the equatorial expansion of the phragmoplasts which extend the cell plate and quickly intersect the walls of the cell. This is in accord with the type of cytokinesis found in all somatic tissue, the expression of which is dependent upon the dimension of the cell, the plane of division, and the location and size of the nucleus (5). The two daughter nuclei pass into a "resting" state migrating to the central position of the newly-formed compartments at apparently equal rates (fig. 6). The division is transverse to the axis of the cell instead of longitudinal as in the original cambial initial.

The septum is formed in the region of the cell plate during cytokinesis. In mature stages it is always thin, in contrast to the heavy secondary wall as may be seen in figure 6. In staining reaction it resembles the primary

wall of the original fiber-tracheid, although the delicate nature of the septum made inadequate the use of chemical tests and polarized light to determine definitely whether the septum is formed only of intercellular cement substance or whether it consists of the intercellular substance and two adjacent primary walls.

The septate condition of these fiber-tracheids may be distinguished in radial, tangential and occasionally in transverse sections. As far as can be determined, the formation of septa is not confined to any particular region, but may occur in any part of the secondary wood formed during a single growing season. Septa and nuclei are apparent in most of the fiber-tracheids. However, the mitotic figures associated with the formation of septa are infrequent.

The original fiber-tracheid has now become, by the formation of a septum, a septate fiber-tracheid containing two nuclei within the confines of the original cell walls. It has been suggested (14) that the presence of septa in fiber-tracheids indicates a stage "intermediate to parenchyma rather than to tracheal elements," but according to Bailey (7) internal septation, while not a "characteristic of fibers," is also not evidence of transition to parenchyma. This is true because of the fundamental difference in the ontogeny of the cell and the constitution of the secondary walls. Our evidence supports this last assertion, because in their ontogeny and later development these cells are true fiber-tracheids with characteristic secondary walls. The internal septations are a later development, which in no way alters the fundamental nature of the original cell. It is apparent that the fundamental difference between the formation of certain parenchyma and tracheal elements is one of the timing of division, which may or may not be characteristic of development and maturation of the cells within a species.

If the divisions which form septa occur before the secondary wall is laid down, a strand tracheid or a wood parenchyma strand would result. If the divisions occur after the formation of the secondary wall, a septate fiber-tracheid would be the result.

In the formation of septate fiber-tracheids there is also an element of timing of the division which may be significant. It would be interesting to know how long a cell may remain a nucleated fiber-tracheid before becoming a septate fiber-tracheid, and whether each nucleated fiber-tracheid is a potential septate fiber-tracheid. This is significant in view of the fact that these elements have been used as diagnostic criteria in classification. However, one must emphasize the fact that it has not been determined whether in a definite section of wood all the cells have reached their end point of development or have been stopped in some intermediate stage. Observations on these points by numerous workers will aid in giving a true significance to the use of these variable elements in classification.

The occurrence of cytokinesis in the formation of septate fiber-tracheids distinguishes these elements from the truly multinucleate fibers which occur, at times, in the phloem. The formation of the cells under discussion also differs from the formation of cells by the cambial initials of the higher plants (1), (2), (3), (4), (5) in that, while the protoplasts involved are capable of divisions within the original cell, the resultant cells or compartments do not undergo the normal maturation pattern of cells derived from the cambium.

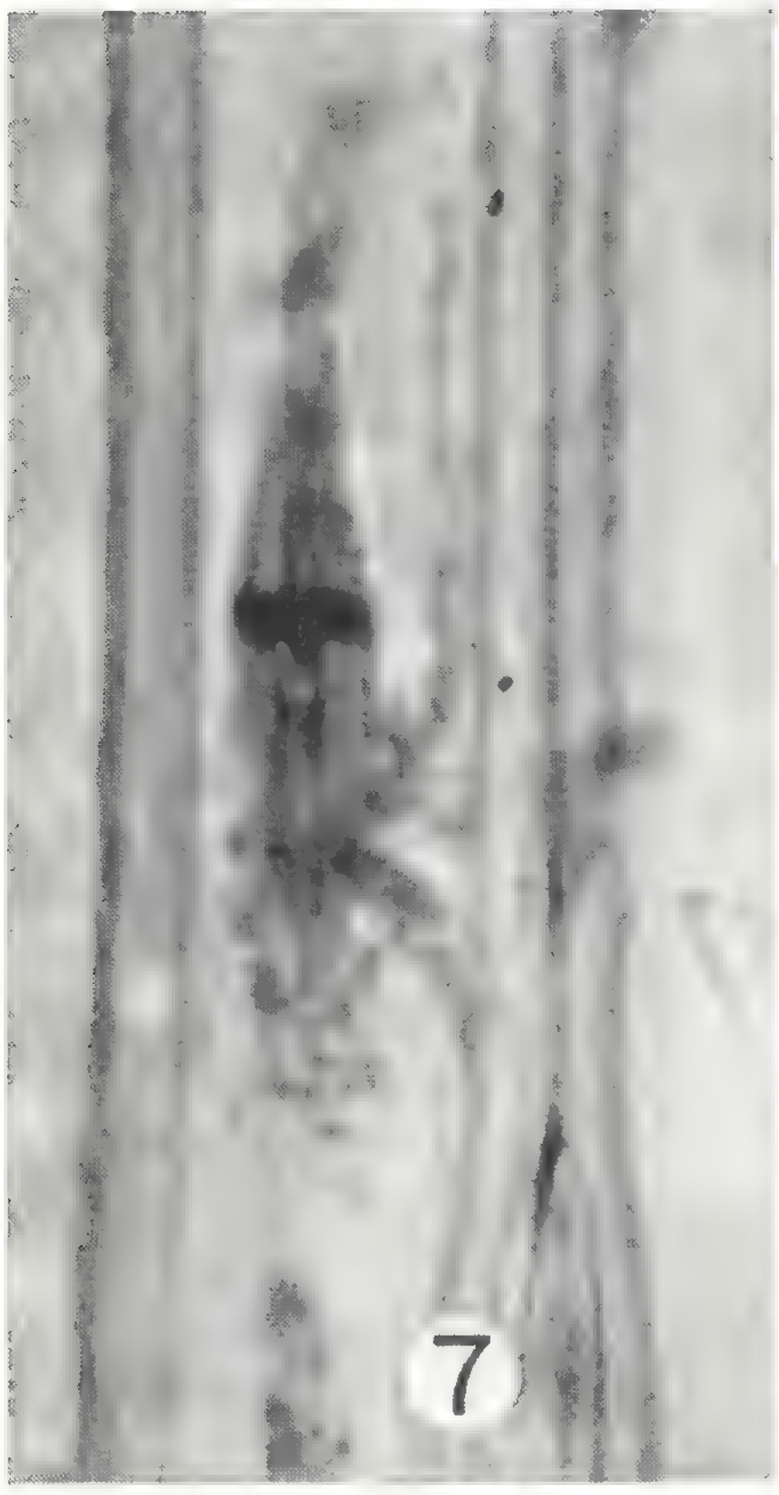
It is held by some (9, p. 153) that the protoplast disappears during the development of the lignified secondary wall of tracheary elements. Fuchs (11), in discussing the origin of lignin, suggests that the formation of lignin occurs only in those cells in which the protoplasm is

EXPLANATION OF THE ILLUSTRATION

FIGURE 7. Photomicrograph of metaphase division figure in fiber-tracheid. × ca. 1800.

FIGURE 8. Photomicrograph of telophase division figure in fiber-tracheid. × ca. 1800.

FIGURE 9. Photomicrograph of late telophase division figure in fiber-tracheid. × ca. 1800.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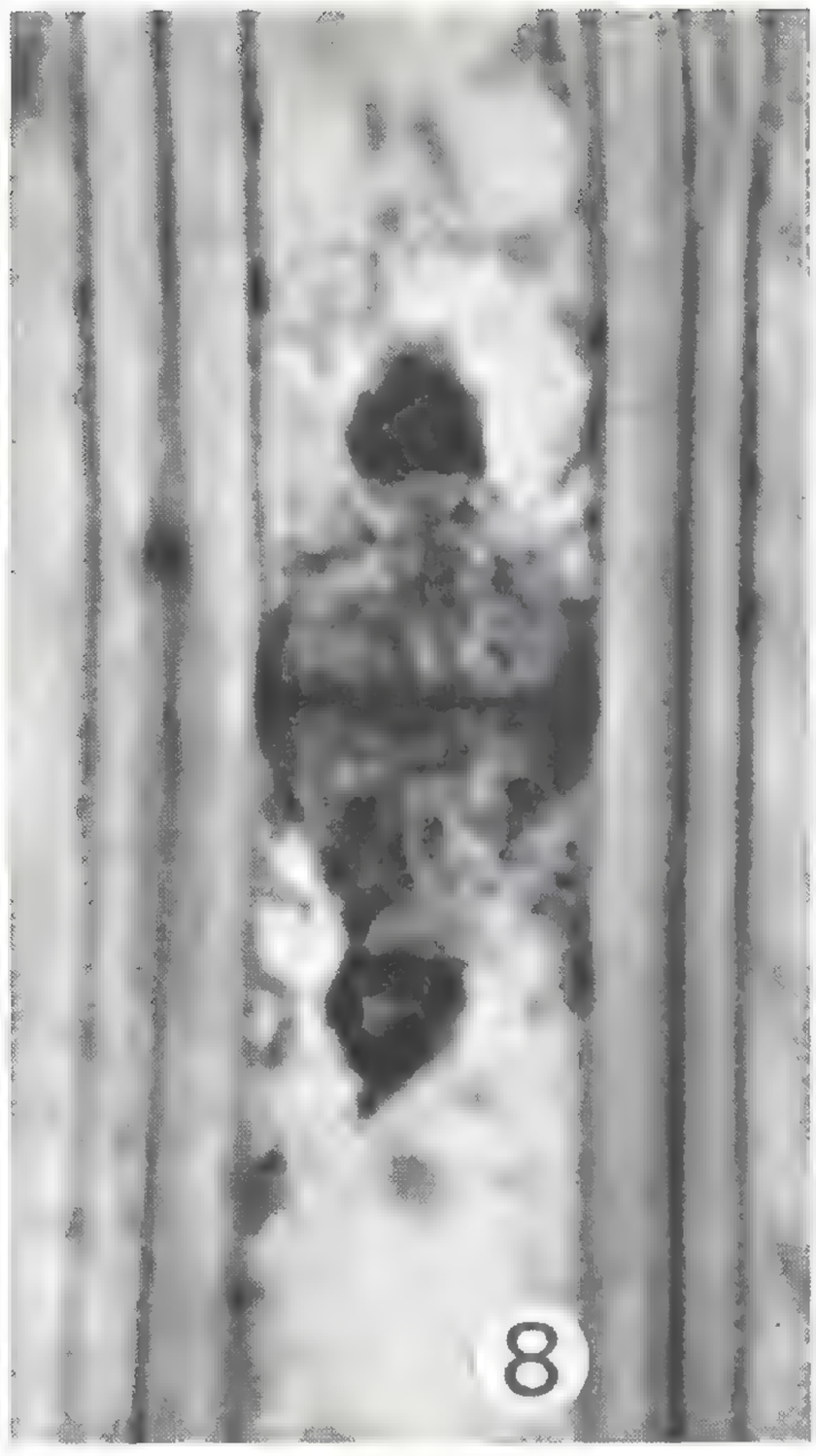
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dying, while Griffioen (13) contends that although lignification is a vital process, it proceeds with the necrosis of the cell content and the death of the cell. In this connection, it is significant that, following the formation of a lignified secondary wall, the septate fiber-tracheids of *Hypericum Androsaemum* remain alive with a functionally active protoplast for a considerable period of time.

SUMMARY

The formation of septa in the fiber-tracheids of *Hypericum Androsaemum* L. is reported. The development of the fiber-tracheids is normal in that they undergo elongation and maturation of the secondary wall. However, the protoplast remains active and usually undergoes division at a right angle to the original division of the cambial initial. This division consists of true karyokinesis followed by cytokinesis. The septum is formed in the region of the cell plate and the daughter nuclei migrate to the central portion of the newly formed compartments. As far as can be determined, the formation of septa is not confined to any particular region, but may occur in any part of the secondary wood formed during a single growing season. The evidence is clear that the definition of a septate fiber-tracheid suggested by the Committee on Nomenclature of the International Association of Wood Anatomists is in agreement with the observable ontogeny and later development of the fiber-tracheid.

In conclusion, the authors wish to thank Professor R. H. Wetmore, under whose direction the original work was started, and Professor I. W. Bailey, for their helpful suggestions and active interest in this work.

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SOME NOMENCLATORIAL TRANSFERS AMONG PERUVIAN ORCHIDS

BY

CHARLES SCHWEINFURTH

INCIDENT to working on the orchid flora of Peru, the following specific reductions were found advisable.

Elleanthus conifer *Reichenbach filius* in Walpers Ann. 6 (1862) 474.

Evelyna conifera Reichenbach filius & Warscewicz in Bonpl. 2 (1854) 113.

Elleanthus Weberbaueriamus Kränzlin in Engler Bot. Jahrb. 54 (1916) Beibl. 117, p. 28.

Elleanthus conchochilus Schlechter in Fedde Repert. Beihefte 9 (1921) 46; in Beihefte 57 (1929) t. 103, Nr. 402.

A drawing from the type of *Evelyna conifera* from the Reichenbach Herbarium in Vienna has narrowly lanceolate leaves which are long-attenuate and up to about 22 cm. long and 2.5 cm. wide, a raceme about 6 cm. long and a lip which appears to be broadly rounded at the apex.

On the other hand, a photograph of the type of *Elleanthus Weberbauerianus* accompanied by floral analyses shows narrowly oblong-lanceolate acuminate leaves up to 14 cm. long and about 2 cm. wide, a raceme about 10 cm. long and a lip which is retuse at the apex.

However, a specimen *(Soukup 47.3)* apparently identical with *E. Weberbauerianus* has lanceolate-elongate-attenuate leaves up to 21 cm. long and 3.5 cm. wide, while the immature raceme is almost 7 cm. long. Another collection *(Macbride 3489)* has the leaf-blade of typical *E. Weberbauerianus*, up to only 15.8 cm. long, and a raceme about 8 cm. long. A further number *(Weberbauer 7868)* has leaves of both forms (elongate-lanceolate

and oblong- or elliptic-lanceolate) up to 19.5 cm. long and 4.3 cm. wide, and racemes up to about 9 cm. long.

Elleanthus conchochilus has somewhat smaller leaves (up to 11 cm. long and 2 cm. wide), a raceme up to 6 cm. long and floral segments (shown by analyses of the type as well as by the description) which are almost identical with those of *E. Weberbauerianus*.

Apparently the only noteworthy difference between the concepts is one of flower-color, *E. Weberbauerianus* being purple with white and brown lip and *E. conchochilus* said to be yellow.

It thus appears that these three concepts are specifically identical.

Elleanthus hymenophorus *Reichenbach filius* in Walpers Ann. 6 (1862) 480.

Evelyna hymenophora Reichenbach filius in Bot. Zeit. 10 (1852) 710.

Evelyna discolor Reichenbach filius & Warscewicz in Bonpl. 2 (1854) 113.

Elleanthus discolor Reichenbach filius in Walpers Ann. 6 (1862-3) 480-1.

In his original description of the Peruvian *Evelyna discolor*, Reichenbach cites as the more obvious differences from the related *E. hymenophora* the violet underside of the foliage, the erect inflorescence, the denticulate (not entire) keels on the lateral sepals, the broader more denticulate lip and the erect triangular acute (not retuse) rostellum.

A specimen of the type number of *Evelyna discolor* in our herbarium does not show any noticeable difference in coloration between the leaf surfaces, and the floral parts appear to match those of *E. hymenophora*, with the keels on the lateral sepals entire or nearly so. Moreover, an authentic specimen of the Central American *Ellean-*

thus hymenophorus from the Reichenbach Herbarium has a nearly erect raceme as in *E. discolor*, while a floral analysis on the same sheet shows a suborbicular dentate lip and the triangular tip to the rostellum described for *E. discolor*. Furthermore, a series of specimens of *E. hymenophorus* in our herbarium shows more or less erect racemes.

As now conceived, *Elleanthus hymenophorus* extends from Costa Rica, through Panama and Colombia to Peru.

Altensteinia fimbriata *Humboldt, Bonpland & Kunth* Nov. Gen. et Sp. 1 (1816) 333, t. 72.

Altensteinia sceptrum Reichenbach filius Xen. Orch. 1 (1854) 18, *nomen subnudum.*

Altensteinia boliviensis Rolfe in Mem. Torr. Bot. Club 4 (1895) 265.

The concept *Altensteinia sceptrum* was in part separated from *A. fimbriata* by its twice larger stature; but, in view of the great variation in size in *A. fimbriata*, this distinction seems inconsequential. A further characterization attributed to *A. sceptrum* is that the lip is orbicular. However, a specimen in our herbarium bearing the data of the type collection of *A. sceptrum* shows the round-ovate lip common to *A. fimbriata.*

Altensteinia boliviensis was described as "a less vigorous plant" than *A. fimbriata*, "with distinctly smaller flowers." However, we have seen a Peruvian collection of *A. fimbriata (Macbride & Featherstone 1225)* which is an even smaller plant than typical *A. boliviensis* but has considerably larger flowers than that concept with a suborbicular, not elliptical, lip.

Another Peruvian collection *(Herrera 3503)* has measurements which appear nearly identical with those of *A. boliviensis*, but the lip is suborbicular, not elliptical as described.

Thus there does not appear to be any justification for the above segregations from the variable *A. fimbriata*, a species which appears to show many gradations in the form of the lip from suborbicular to round-ovate or round-elliptic.

Altensteinia marginata *Reichenbach filius* Xen. Orch. 3 (1878) 20.

Prescottia pteristyloides Kränzlin in Engler Bot. Jahrb. 37 (1906) 393.

Altensteinia pterostyloides Schlechter in Fedde Repert. Beihefte 9 (1921) 126.

A careful comparison of these two concepts, as represented by records of the types as well as by the descriptions, indicate that they are conspecific.

The only discrepancies appear to be that *A. marginata* shows somewhat broader leaves than those of the type of *Prescottia pteristyloides*, and that the latter concept is noted as having narrowly lanceolate 1-nerved lateral sepals, whereas the lateral sepals of *A. marginata* are described as oblong and 3-nerved and are drawn as elliptic-lanceolate and 3-nerved. Both species came from regions of the same altitude.

Altensteinia Matthewsii *Reichenbach filius* Xen. Orch. 3 (1878) 19.

Ia Matthewsii Schlechter in Fedde Repert. 11 (1912) 150.

Ia Lechleri Schlechter in Fedde Repert. Beihefte 9 (1921) 52; in Beihefte 57 (1929) t. 105, Nr. 411.

Judging from habit and analytical drawings of *Altensteinia Matthewsii* from the Reichenbach Herbarium in Vienna as well as from a specimen of that species identified by Reichenbach, it seems unwise to segregate from it the concept *Ia Lechleri*. Indeed the only discrepancy

between the concepts appears to be that *Aa Lechleri* is described as having longer lateral sepals than *Altensteinia Matthewsii*.

Stenoptera acuta *Lindley* Gen. & Sp. Orch. Pl. (1840) 447—Cogniaux in Mart. Fl. Bras. 3, pt. 4 (1895) 252, t. 59, fig. 1.

Stenoptera elata Schlechter in Fedde Repert. Beihefte 9 (1921) 54; in Beihefte 57 (1929) t. 86, Nr. 335.

A comparison of *Stenoptera acuta*, as represented by a photograph of that species from the Lindley Herbarium at Kew, as well as by the detailed description and figure in Cogniaux's treatment of *S. acuta* (l.c.), shows that it cannot reasonably be separated from *S. elata* as represented by the description and figure (l.c.).

In fact the only discrepancies between the two concepts seem to be that *S. elata* is described as a rather taller plant with somewhat larger leaves and longer spike than *S. acuta*.

A Peruvian specimen referable to *S. acuta* (*Weberbauer 7583*) is almost as tall as *S. elata* and has even longer leaves than that concept.

Peru: Ayacucho, Prov. Huanta, Choimacota Valley, at 3000 meters altitude, "evergreen bush-wood", flowers greenish, February 28-March 10, 1926, *A. Weberbauer 7583*; Road from Tambo above Osno to the Apurimac, at 2800-3000 meters altitude, June 1910, *Weberbauer 5651*.—Huánuco, Cuzco (ex Kränzlin) fide Schlechter. Also Brazil (type) and Bolivia.

Stenoptera pilifera *(HBK.) C. Schweinfurth comb. nov.*

Altensteinia pilifera Humboldt, Bonpland & Kunth Nov. Gen. et Sp. 1 (1816) 333, t. 73.
Stenoptera cardinalis Lindley Gen. & Sp. Orch. Pl. (1840) 448.

Porphyrostachys pilifera Reichenbach filius Xen. Orch. 1 (1854) 18.

Spiranthes orchioides sensu Kränzlin in Engler Bot. Jahrb. 26 (1899) 499, non A. Richard.

Since it appears wise to transfer this concept to the genus Stenoptera, the specific epithet *pilifera* must be used instead of the more lately applied adjective *cardinalis*.

The species appears to be widely distributed in Peru, as well as occurring in Ecuador.

A NOTABLE EXTENSION OF RANGE OF EPIDENDRUM ONCIDIOIDES VAR. GRAVIDUM

BY

CHARLES SCHWEINFURTH

IT IS interesting to report the occurrence in the West Indies of *Epidendrum oncidioides* Lindl. var. *gravidum* (Lindl.) A., H. & S.

The first West Indian collection of this widespread Central American form is here recorded from Cuba, Province of Oriente, Loma del Gato, September 1935, *Julian Acuña s.n.*

A second West Indian collection of this plant is from Puerto Rico. It is recorded from Maricao, growing on a stump, June 1939, *A. G. Kevorkian 6177*. The flowers are noted as being yellowish-green but do not expand at this station. In this latter particular they resemble those of the type of *E. gravidum* Lindl. which was collected in Mexico.

Epidendrum oncidioides was described from Brazil, but has been recorded from various parts of South and Central America and from Cuba.

A NOMENCLATORIAL TRANSFER

BY

CHARLES SCHWEINFURTH

Maxillaria ampliflora *C. Schweinfurth nom. nov.* *Camaridium grandiflorum* Ames in Proc. Biol. Soc. Wash. 34 (December 1921) 149, non *C. grandiflorum* Schltr. in Fedde Repert. Beihefte 9 (September 1921) 165.

As recent studies have convinced us that the concepts Camaridium and Maxillaria are congeneric, the Central American plant described as *Camaridium grandiflorum* Ames should, in our opinion, be referred to the genus Maxillaria. The prior use of the combination *Maxillaria grandiflora* by Lindley necessitates a new name.

This species was originally described from the Province of Chiriquí, Panama, *(E. P. Killip 3565)*; but a fragmentary specimen from San Jerónimo, Costa Rica *(M. Valerio 2709)* is also referable to *Maxillaria ampliflora*.

Closely allied species are *Maxillaria semiorbicularis* A. & S. and **M. planicola** *C. Schweinfurth nom. nov.* *(Camaridium latifolium* Schlechter in Fedde Repert. Beihefte 17 (1922) 74, non *Maxillaria latifolia* Lindl.) which grows in low places. *M. semiorbicularis* differs in having a dissimilar lip with relatively large lateral lobes and *M. planicola* differs in having prominent pseudobulbs, distinctly petioled leaves and obtuse lateral lobes of the lip.

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PLANTAE MEXICANAE VI

BY

RICHARD EVANS SCHULTES

NEW AND SIGNIFICANT SPECIES OF SAURAUIA FROM NORTHEASTERN OAXACA

DURING the course of botanical and ethnobotanical investigations in northeastern Oaxaca, Mexico, the writer had an opportunity to study in the field and to collect specimens of several species of the perplexing dilleniaceous genus, *Saurauia*. In the present paper, three species are discussed from the point of view of their botanical and ethnobotanical interest; one of them represents a new species which is herein described.

Saurauia aspera *Turczaninov* in Bull. Soc. Nat. Moscou 31 (1858) 242.

MEXICO: Oaxaca, District of Choapam, partially cleared field near the town of San Juan Lalana, long. 95°45′, lat. 17°25′, altitude 600 m., May 13, 1939, *Schultes 490* (TOPOTYPE) Herb. Gray.

Although it is very scantily represented in herbaria, *Saurauia aspera* is the commonest and most abundant species of the genus in the northeastern districts of Oaxaca at altitudes between 500 and 1500 meters. Because of its economic value to the natives, it is spared when forests are cut down to provide new *milpas*; as a consequence, it often appears in gardens and around towns in abundance.

Saurauia aspera differs from many of the other Oaxacan species of the genus in exhibiting a definite predilection for sunny exposures. Although it is found to some extent in the forests, the tree is most abundant and apparently thrives better and grows larger when exposed to direct sunlight. It is one of the most characteristic of the heliophiles of the region and is usually seen in association with the orchidaceous *Epidendrum radicans* Pavon ex Lindl. and *Sobralia macrantha* Lindl., the gentianaceous *Chelonanthus alatus* (Aubl.) Pulle and *Lisianthus nigrescens* Schlecht. & Cham., and other notable sun-lovers.

The size of *Saurauia aspera* is variable. The collection which is cited above (consisting of more than 100 specimens and 100 wood samples) was made from a small tree growing in a sunny field. The tree is only about twenty or twenty-five feet tall, but its branches are very wide-spreading. The trunk measures ten inches in diameter one foot from the ground. The bark is soft, light greyish-brown. The wood is soft, white and coarse. This species is easily recognized by the extremely wide-spreading branches and the large number of showy inflorescences which bear a profusion of conspicuous, sweet-scented, white flowers.

Misinterpretation of the data supplied on the labels of some of the older collections led Buscalioni, who monographed the American species of *Saurauia* (Malpighia 27 (1916) 297), to present a very confused picture of the distribution of *Saurauia aspera*. In view of this, a few facts concerning the distribution of *Saurauia aspera* and its botanical history may be of interest. *Saurauia aspera* is apparently endemic to the northeastern part of the state of Oaxaca and the adjacent border of Vera Cruz. In northeastern Oaxaca, it is abundant in the Districts of Choapam, Villa Alta, Ixtlán, Cuicatlán, and Teotitlán.

In 1839, Galeotti collected the type of *Saurauia aspera (Galeotti 7325)* in San Juan Lalana, the locality of *Schultes 490*. Four specimens of this Galeotti collection were examined by Buscalioni and cited in his monograph (l.c. 297); he indicated, with reservation, that "Lalana" was in Oaxaca.

In the same year (1839), Jürgensen collected *Saurauia aspera* in the mountains of San Pedro Nolasco near Talea de Castro, District of Villa Alta, long. 96°15′, lat. 17° 26′. Buscalioni (l.c. 389) was unable to discover this locality on the standard maps of Oaxaca; he noted, however, that in the Gulf of California there was an island by the name *San Pedro Nolasco* and he suggested that the Jürgensen collection was made on this desert island. This locality in the Gulf of California is many hundreds of miles from Oaxaca; *Saurauia* is not represented in the dry northwestern parts of Mexico; and Jürgensen never visited this region. Consequently, the suggestion that the Jürgensen collection was made on an island in the Gulf of California should never have been advanced. Fortunately for scientific accuracy, Standley (Contrib. U.S. Nat. Herb. 23 (1923) 817) ignored Buscalioni's erroneous suggestion and stated that *Saurauia aspera* was "known only from Oaxaca, the type locality".

The fruits of *Saurauia aspera* are very sweet and mucilaginous and are utilized as food by all the Indian tribes of northeastern Oaxaca. They are eaten fresh or are cooked. They are also dried and kept for later use. A decoction is made from the fruits, and it is said by the natives to be an effective emollient because of the quantity of mucilage which is extracted. This decoction is administered for coughs, colds and throat irritations.

In northeastern Oaxaca, *Saurauia aspera* is known by the following Spanish names: *mameyito* ("little mamey"); *palo de moca* ("sticky tree"); *pipicho*. Among the In-

dians, it is known by the following names: Chinantec: *ma-do-tza*; Mazatec: *shka-ya-no*: Mije: *mokepi* and *shray-tsi*; Zapotec: *ya-ga-tse-go*.

Saurauia Conzattii *Buscalioni* in Malpighia 25 (1913) 403, t. 6, fig. 9.

Mexico: Oaxaca, District of Cuicatlán, San Juan Zautla, long. 96° 40′, lat. 17°58′, June 16-22, 1898, *V. Gonzales & C. Conzatti s.n.*; District of Ixtlán, Cerro Hueso, between San Pedro Yolox and San Juan Tepetotutla, long. 96°25′, lat. 17°48′, altitude 2500 m., June 26, 1939, *Schultes 695* (Econ. Herb. Oakes Ames; Herb. Gray).

Hitherto, *Saurauia Conzattii* has been known in herbaria by two collections: the type, represented by *H. & C. Conzatti s.n.* (discussed below); and the collection by Gonzalez and Conzatti (cited above), a specimen of which is preserved in the Gray Herbarium. *Schultes 695* was collected only a few miles southeast of the locality of these other collections. The plant apparently represents a very restricted endemic, because it has never been found anywhere except in the District of Cuicatlán and the northern part of the adjacent District of Ixtlán in northeastern Oaxaca, where it inhabits the highest parts of the local mountains.

Saurauia Conzattii is a forest-dwelling shrub up to five or six feet in height. It has leaves which are extremely large in relation to its height. Conspicuous because of its profusion of white flowers which measure 2.5 cm. across, it is at once distinguishable in the dark, wet forests of the limestone mountains. The slender branches and dark green leaves are very densely clothed with reddish brown setae. *Saurauia Conzattii* is not abundant where it occurs. *Schultes 695* was collected from a single isolated colony consisting of six shrubs. No other colonies were seen.

In the original description of *Saurauia Conzattii*, Bus-

calioni cited only the type collection. His manner of citation (with erroneous spelling of locality names), however, is very misleading and might suggest that he had seen several collections: ". . . Cerro della Raya, a Cujacuemalco, a Chinaulta e a Curicateca. . .". The correct data for this collection, as ascertained from herbarium labels as well as from Professor Conzatti personally, is: "*H. and C. Conzatti*, June 24, 1909, Cerro La Raya, Cuyamecalco, Chinantla-cuicateca, District of Cuicatlán, alt. 2800 m.". Because this locality is not marked on standard maps, it may be helpful to add to this data the longitude and latitude of Cerro La Raya, which is long. 96°48′, lat. 17°57′.

Although apparently an extremely rare shrub, *Saurauia Conzattii* fruits very abundantly, and, in consequence, the Chinantec and Cuicatec Indians, who value its fruit as food, visit the localities where it grows during its fruiting season. These Indians report that the fruit is very sweet and mucilaginous. No medicinal use is made of this species. The Chinantecs know the shrub as *mado-chay*. The local Spanish names are: *mameyito* and *pipichito*.

Saurauia speluncicola *R. E. Schultes sp. nov.*

Frutex magnus, saepissime pendulus. Rami setoso-pilosi. Foliorum lamina coriacea, obovata, breviter acuminata, basi cuneata, maxima pro parte integra sed apice leviter inaequaliterque undulata, margine setis ornata; lamina supra atroviridis, scabra, setis fuscis sparse obsessa; lamina infra cana, velutina, densissime stellato-pilosa albis cum pilis, et sparsissime cum setis fuscis obsessa. Inflorescentia saepissime foliis multo brevior; pedunculus setoso-pilosus; bracteae setoso-pilosae, lineares. Flores aliquid numerosi. Sepala quinque; sepala interiora tres, lutea, orbicularia, inflexis cum marginibus

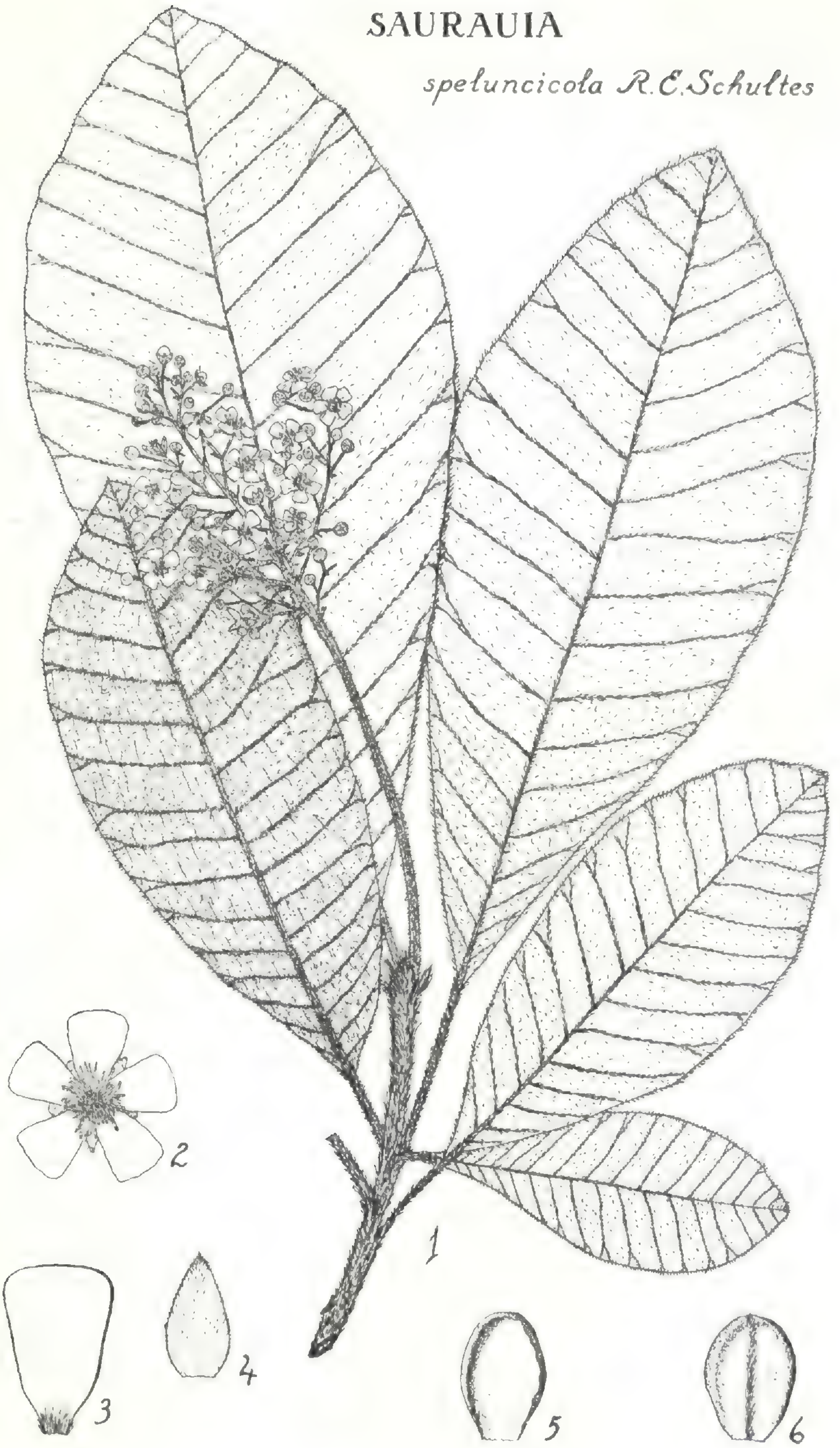
EXPLANATION OF THE ILLUSTRATION

SAURAUIA SPELUNCICOLA *R.E.Schultes*. 1, leaves and inflorescences natural size. 2, flower, magnified three times. 3, petal, magnified six times. 4, outer sepal, magnified six times. 5, inner sepal (interior), magnified six times. 6, inner sepal (exterior), magnified six times.

Drawn by RICHARD EVANS SCHULTES

SAURAUIA

speluncicola R.E.Schultes



puberulenta, extus cum setarum robustarum carina media prominenti; sepala exteriora duo, viridi-aurea, triangulari-elliptica, obtusa, extus crasse pubescentia, intus puberula. Petala quinque, fere usque ad basim libera, subquadrangulata, glabra, alba. Stamina viginti duo. Ovarium globosum, glabrum, quinque cum stylibus carnosis. Fructus ignotus.

A large shrub, usually hanging, with stout branches. Branches brownish setose-pilose, the closely appressed setae up to 5 mm. long. Leaf blades coriaceous, obovate, short-acuminate, cuneate at the base, entire except for a slight, uneven undulation near the apex, the margin armed with bristles up to 0.5 mm. long. Upper surface of the leaf dark green, scabrous, minutely papillose, sparsely beset with brown setae which are about 2.5 mm. long, rather densely brown-setose along the nerves, the setae about 5 mm. long; lower surface grey, velvety, very densely stellate-pilose with whitish hairs, very sparsely beset with brown setae, rather densely brown-setose along the nerves. Petioles setose-pilose, 3.5–5 cm. long. Peduncle and inflorescence 21–27 cm. long, usually much shorter than the leaves; peduncle setose-pilose; pedicels strong, setose-pilose, 5 mm. long; bracts setose-pilose, linear, about 5 mm. long; inflorescence 5–8 cm. long, about 5–7 cm. broad. Flowers rather numerous, 1.5 cm. or less in diameter. Sepals five; the inner sepals three, yellow, orbicular, with inrolled margins, 6 mm. long, 5 mm. wide, puberulent, externally with a prominent central keel of strong bristles, each 2 mm. long; outer sepals two, greenish-yellow, triangular-elliptical, obtuse, 6 mm. long, 4 mm. wide, coarsely pubescent externally, puberulent internally. Petals five, free almost to the base, subquadrangulate, 8 mm. long, 6 mm. wide, glabrous, white. Stamens twenty-two; anthers 3 mm. long, versatile; filaments 3 mm. long, adherent to the

base of the corolla, setose-barbate at the base. Ovary globose, glabrous, 5-celled, surmounted by five short, fleshy styles. Fruit unknown.

MEXICO: Hanging from limestone rocks, western end of the barranca Nin-du-da-gé, San Antonio Eloxochitlán, long. 96°45′, lat. 18°12′, District of Teotitlán, Oaxaca, altitude 1100 m., July 6, 1939, *Richard Evans Schultes 795* (TYPE and habit photograph in Herb. Gray; ISOTYPE and habit photograph in Econ. Herb. Oakes Ames and in Herb. Schultes; WOOD SAMPLES from TYPE in Wood Collection, Biol. Lab., Harvard Univ.); same locality, July 24, 1938, *Schultes & Reko 235* (TOPOTYPE in Econ. Herb. Oakes Ames, Bot. Museum Harvard Univ. and in Herb. Gray).

Saurauia speluncicola is a very beautiful species inhabiting the shaded, damp hollows which are formed by the overhanging crags of a deep gorge or *barranca*. The shrub usually has a hanging or partly hanging habit with its strong roots inserted in cracks in the limestone walls of the hollows. In some places, the leaves are exposed to the continual dripping of lime water which seeps through the walls.

The specific epithet—*speluncicola*—refers to the peculiar habitat of the plant and means "growing in hollows".

This species represents not only a very local endemic but also an extremely rare plant. I collected in the District of Teotitlán in 1938 and 1939 and devoted many hours to the region around San Antonio Eloxochitlán. Although I searched carefully for other stations for *Saurauia speluncicola*, I was unable to find it growing anywhere except in the *barranca* Nin-du-da-gé, the type locality. In this *barranca*, furthermore, the species grows in isolated colonies and is not abundant.

If one uses Standley's key to the Mexican species of *Saurauia* (Contrib. U.S. Nat. Herb. 23 (1923) 814-815), the two collections (*Schultes 795* and *Schultes & Reko*

235) key out close to *Saurauia Radlkoferi* Busc. Although I have not seen the type of *S. Radlkoferi* (the precise locality of which is unknown), a careful examination of the description and the figure of it indicates that no close relationship exists between *S. Radlkoferi* and *S. speluncicola.* It is true that the indument of the under surface of the leaf of both species is finely stellate-pilose, but the two are readily differentiated by conspicuous floral and vegetative characters.

Saurauia speluncicola appears to be related to several other species of northeastern Oaxaca, but the degree of relationship is not clear because of the lack of sufficient comparative material. In a number of respects, *S. speluncicola* agrees with *S. Conzattii* Busc., *S. aspera* Turcz. and *S. villosa* DC., but it is unmistakably distinct from these three allies. It differs from all of them in a number of minor characters and can be distinguished from *S. Conzattii* and *S. aspera* immediately because of the stellate-pilosity on the under surface of its leaf.

In the District of Teotitlán, the Mazatec Indians use the sweet, mucilaginous fruits of *Saurauia speluncicola* as food. The plant is said to fruit very heavily. The fruits are eaten fresh or are cooked. No medicinal use is made of this species of *Saurauia* among the Mazatecs. *Saurauia speluncicola* is called by the Mazatecs *shka-ya-no,* the same name by which they refer to *Saurauia aspera*; the fruits of *Saurauia speluncicola* are called *to-no.* The plant is known among the Spanish-speaking natives as *mameyito* and *pipicho.*

A NOTEWORTHY COLLECTION OF ANDIRA GALEOTTIANA

BY

RICHARD EVANS SCHULTES

Among other plants recently sent from the Botanical Museum to Dr. Paul C. Standley for study, there was a specimen of the rare *Andira Galeottiana* belonging to the Leguminosae.

Andira Galeottiana *Standley* in Contrib. U.S. Nat. Herb. 20 (1919) 217.

MEXICO: Oaxaca, District of Choapam, San Juan Lalana, long. 95° 45′, lat. 17°25′, alt. 600 m., May 10, 1939, *Schultes & Reko 852* (Econ. Herb. Oakes Ames No. 3930; Herb. Gray; Herb. Field Mus. Nat. Hist.).

The type of *Andira Galeottiana*, an endemic of the District of Choapam (Oaxaca) and adjacent parts of Vera Cruz, was collected in Catemaco, Vera Cruz *(Nelson 424)*. A second collection was cited in the type description as "collected at Lalana (Chinantla) Puebla, July, 1844, by H. Galeotti (no. 3464)". This citation should be corrected to read: "Lalana (Chinantla), *Oaxaca* . . ." *Andira Galeottiana* has not been collected in Puebla so far as herbarium records indicate.

Schultes & Reko 852 was collected in San Juan Lalana, the same village where Galeotti, nearly a century ago, found the cotype. It is apparently the third collection of this tree.

In Lalana, *Andira Galeottiana* is called by the Chinantec name *mo-dzaw* and by the Zapotec name *gia-bia*. In 1844, Galeotti recorded the Spanish vernacular name as *macayo*, and in 1939, Reko and I found the same name still in use for this plant. The species is abundant in Lalana where its profusion of rose-purple panicles is very conspicuous on the hillsides in May and June.